School Shop

vol. II no. 4

December, 1942

Model Building
by G. O. Wilber

Airplane Control Demonstrator
by A. Joseph

Aviation Education in School Shops
by Merrill Hamburg

Pennsylvania State School of Aeronautics
by Robert P. Stoner

Instructional Resources • News from Industry • Washington Letter

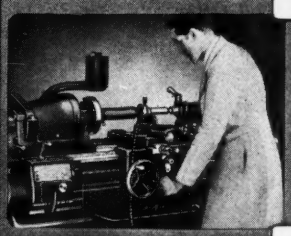
MOTION PICTURES
for Training Lathe Operators

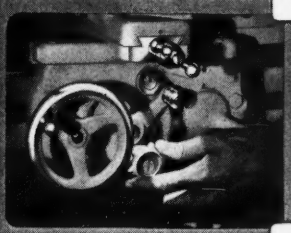
How To Run a
LATHE
Film Series

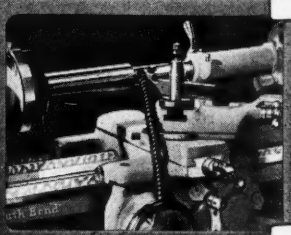
Based on the Book

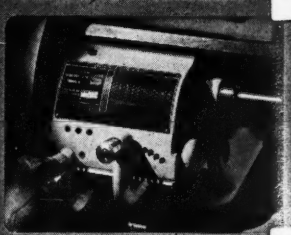
of the same title

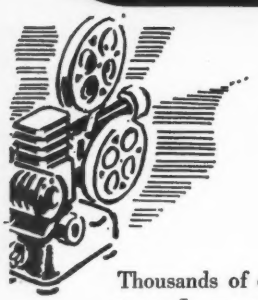
Two 16 mm sound films in full color available on a free loan basis.











Speed up defense training and get your shop classes off to a good start by using the South Bend "How to Run A Lathe" motion pictures. These interesting films demonstrate the best shop practice and methods in elementary lathe operation. They show what a lathe is for, how it operates, the principal lathe operations, and the application of these operations on a representative job.

Thousands of enthusiastic reports attest to the educational value of these pictures. In many school shops they have become a "must" for every new class. They supplement instructional work, reduce personal supervision, and eliminate errors through an effective presentation of lathe operation. Showing time for both films is approximately 40 minutes. Send the coupon for information on securing these films for your classes on a free loan basis.

SOUTH BEND LATHE WORKS, SOUTH BEND, INDIANA

Please send information on the "How to Run a Lathe" films, also send application blank. We are interested in borrowing them for our defense training classes.

*School*_____

*Address*_____

*City and State*_____

*By*_____

SOUTH BEND LATHE WORKS

South Bend, Indiana

LATHE BUILDERS FOR 35 YEARS

Highlights of Coming Issues:

1. ***"Model Yacht Building as a Shop Activity."***
2. ***"Aeromodeling in Aviation Education."***
3. ***"Course Content in Radio Shop."***
4. ***Shop-Tested Projects.***
5. ***And these regular features: Instructional Resources; Shop Training for Victory; Question of the Month; Washington Letter; and others.***

EDITORIAL ADVISORY BOARD

M. Reed Bass, Director, Ranken School of Mechanical Trades, St. Louis, Missouri

Earl Bedell, Director of Vocational Education, Public Schools, Detroit, Michigan

Elmer W. Christy, Director of Industrial Arts, Public Schools, Cincinnati, Ohio

George B. Cox, Professor of Industrial Education, Oregon State College, Corvallis

Roy G. Fales, Supervisor of Industrial Arts, State Department of Education, Albany, New York

George Fern, Director, State Board for Control of Vocational Education, Lansing, Michigan

R. A. Hinderman, Director, Department of Research and Vocational Education, Public Schools, Denver, Colorado

V. P. McKinley, Professor of Trade and Industrial Education, University of Alabama, University

George E. Myers, Professor Emeritus of Vocational Education, University of Michigan, Ann Arbor

Louis V. Newkirk, Director of Industrial Arts, Public Schools, Chicago, Illinois

Irvin S. Noall, Supervisor of Industrial Arts and Occupational Education, Public Schools, Salt Lake City, Utah

Floyd W. Reeves, Professor of Administration, Chicago University.

John J. Seidel, State Director of Vocational Education, Baltimore, Md.

Leslie G. Stier, Principal, Frank Wiggins Trade School, Los Angeles, California

F. Theodore Struck, Head, Department of Industrial Education, Pennsylvania State College, State College, Pennsylvania

Editor
Lawrence W. Prakken
Consulting Editors
Marshal L. Byrn and
Thomas Diamond
Advertising Manager
John M. Trytten

School Shop

FOR INDUSTRIAL ARTS & VOCATIONAL EDUCATION TEACHERS

CONTENTS

December, 1942
Vol. II, No. 4

Model Building as an Industrial Arts Activity. G. O. Wilber..... 2
How to go about instituting model building as an important shop activity.

Project of the Month: Airplane Control Demonstrator. A Joseph..... 4
An excellent device for teaching the linkage control of airplanes.

Aircraft Drafting at Edison High School. H. B. Young..... 5
The program of studies in aircraft drafting in a Rochester, N.Y., high school.

Pennsylvania State School of Aeronautics. Robert P. Stoner..... 6
A description of the program of one of the Nation's largest aeronautical schools.

Model Planes on the Production Line. George Merdutt..... 8
How Detroit schools use production methods to produce Navy models to close tolerances.

"Clouds" of Model Planes. Ben Brodinsky..... 10
The new program of Navy model building is outlined.

News from Industry..... 11
New products, new equipment, and industrial advancements.

Aviation Education in School Shops. Merrill Hamburg..... 12
A practical discussion of problems confronting the establishment of aviation education and how they may be met.

Aircraft Instruments and the Industrial Arts Shop. Joseph H. Quimby..... 14
Methods usable in a school shop for teaching a neglected phase of aviation education.

Instructional Resources: Books, Pamphlets, Visual Aids..... 16
Listing in easy form for clipping and filing.

What Do You Think: What activities and course-of-study changes have you found most valuable in meeting the request of the War Department and U. S. Office of Education to increase aviation activities in school shops?.. 18
How schools are meeting this demand.

Strictly Personal..... 18
About your fellow teachers.

News..... 19
Items concerning the school shop world.

In the Morning Mail..... 20
Questions and comment from readers.

AVA Holds War Work Conference at Toledo..... 21
Highlights of the annual convention.

Model Airplane Fuselage Duplicator. Robert L. Stephens..... 22
A circular saw attachment for simplifying the making of Navy model fuselages.

Washington Letter..... 24
News from the Nation's Capital of particular interest to shop teachers.

Index to Advertisers..... 24

School Shop is published monthly, September through June, at Ann Arbor, Michigan. Manuscripts are paid for at regular space rates and should be addressed to the Editor, School Shop, Box 100, Ann Arbor, Michigan. Subscription rates to libraries and institutions, $2.00 a year; Foreign and Canadian, $3.00 a year. 25 cents a copy. Printed in the U. S. A.

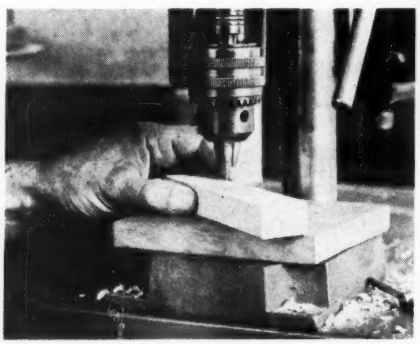
Copyright, 1942, by Lawrence W. Prakken.

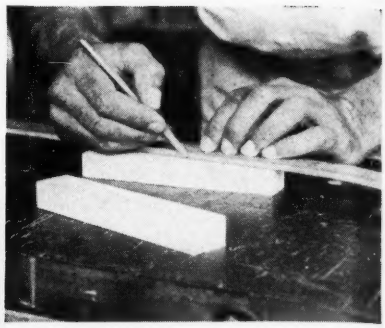
Advertising Representatives: Eastern—Macintyre & Simpson, Room 1837, 101 Park Ave., New York City, Lexington 2-3783; Mid-West—Macintyre & Simpson, 75 East Wacker Drive, Chicago, Central 1715, and 1900 Euclid Avenue, Cleveland, Ohio, Cherry 1501.

Model Building

AS AN INDUSTRIAL ARTS ACTIVITY

BY *Gordon O. Wilber*





If you plan to include airplane model building in your shop work, here is a complete analysis of the factors involved in entering this vital phase of aviation education. Gordon O. Wilber is head of the industrial arts department of Oswego, N. Y., State Teachers College, and author, with Emerson Neuthardt, of "Aeronautics in the Industrial Arts Program."

FROM every side, teachers, and especially industrial arts teachers, are being urged to include the teaching of aeronautics in their courses. It is highly essential that they do this. Very little of a concrete nature, however, has as yet been developed to indicate to them, just which parts of aeronautics they should teach, or the activities they should promote. It is the purpose of this article to present some suggestions bearing on this problem.

There are at least three ways in which the study of aeronautics may be approached in the school. One of these is the traditional textbook approach. It would be possible to study about airplanes and the principles of flight without ever actually seeing an airplane. While such a practice would undoubtedly be better than no instruction, it is about as practical as trying to teach a boy how to milk a cow by reading about it in a book. Mere study about airplanes even if supplemented by laboratory experiments can never be expected to really reach the imagination and enthusiasm of youth in a way that will inspire them to want to fly. This does not mean, however, that textbooks should not be used to supplement a more active program of participation.

A second approach is the thoroughly practical plan of using actual planes and engines as the basis for study. Undoubtedly, this has much to commend it. Planes and plane parts should, if possible, be in every classroom for purposes of study and illustration. At present, however, it appears impossible for most schools to secure such equipment.

There remains, therefore, the third approach—that of model building. There are almost no limits to the opportunities for learning which are afforded by this activity. U. S. Commissioner of Education Studebaker, in speaking on this subject, said:

"The air-minded boy, through his efforts in model aircraft activities, develops many desirable personal characteristics such as ingenuity, good habits of study, appreciation of precise thinking, the spirit of sportsmanship, and some understanding of a vital service to the Nation."

Studies made in the past have shown that while some two to three million boys and girls have been engaged in model building, only a very few schools have undertaken to sponsor this important activity. It is now time for *all* industrial arts teachers to recognize the possibilities offered by model building and evince a spirit of leadership in its develpment in the school program.

Tools and Equipment

The average wood or general shop has most of the tools and equipment needed to promote a successful program of model building. Some of the specialized equipment which may be required includes:

Balsa strippers. (May be made in shop).
Razor blades (with holders) for cutting balsa.
Model maker's knives—may be purchased from model supply houses, for from 10 to 20 cents.
Atomizer—for spraying paper covered surfaces.
Motor winder—for winding the rubber on large models.
Various jigs for holding and gluing parts—may be made as needed.
Propeller balancing device (may he made).
4" scissors.
Long-nose pliers.
Water color brushes.

Supplies

The special supplies required for model building are relatively inexpensive. Stock sizes may be purchased and handed out as required or kits may be used. Where kits are available for a given model, there seems to be considerable merit in purchasing materials in this form. For special or experimental models, however, the following list is suggested. It will be necessary to buy additional items for special models as the course develops.

Balsa wood—the most common material used in model building. It may be purchased in plank form and cut to required size on a smooth cutting saw, or may be secured in stock sizes. The following are those most commonly used:

1/32" x 3"; 1/16" x 3"; 1/8" x 3"; 1/16" x 2"; 1/8" x 2"; 1/2" square; 5/8" by 1¼"; ¾" x 1½"; 1" x 1¾"; 1/16" square; 1/8" square; 1/8" x ¼" square; 1/8" x 1/2" square; 3/16" square; ¼" square.

Note: Balsa wood is becoming increasingly difficult to obtain due to its use in the manufacture of life rafts and other essential war products. If balsa cannot be secured, pine and basswood are recommended as substitutes. Teachers should secure, if possible, the article by A. H. Thomas in Vol. XVIII of *Air Trails*, pp. 28-29 and 53, entitled "Ersatz Model." It explains in detail the use of materials which can be substituted for balsa and other "hard-to-get" items.

Music Wire. The following gauges are recommended: 6 gauge .016; 8 gauge .0197; 10 gauge .0236; 12 gauge .0236; 14 gauge .033.

Model Airplane Cement—in small tubes.

Rubber Bands: 1/8" sq., 1/8" flat, 3/16" flat. NOTE: Rubber for model airplane is still available in limited amounts from some supply sources. It should be powdered and kept in a dark, dry place.

Tissue (for covering).

Washers (for propeller shafts) 1/16" dia., 1/8" dia.

Dope—Clear and colored.

Dope Thinner

Pins—for holding small parts while gluing.

Introducing the Model Building Program

Industrial arts teachers will find little difficulty in introducing model building in their courses. Between two and three million boys and girls have been engaged in this activity as a hobby during the past several years. Almost every

Left, above: making propeller-shaft hole before carving, using pin in sensitive drill. Right, above: marking centers on propeller block prior to drilling shaft hole and carving blades.

class will have at least one or two students who have done model building and will be able to help with technical problems. As regards the actual technic of starting the work the following suggestions are made:

1. Select models with care. Do not attempt too difficult types for beginners. More boys have lost interest in model building through attempting a model which was beyond his ability than for all other reasons. A simple glider is suggested.

2. Have a model made up so that it may be demonstrated to the class.

3. Work out with the class the procedure for making the glider.

4. Demonstrate all steps fully and completely. The best success insurance is being sure that every member of the class knows exactly how each operation is performed.

5. Set up an aeronautics center in your shop. Designate one or two benches near which the supplies and equipment for model building can be centered. Use charts, drawings, and models on the wall to give an aeronautical atmosphere.

6. Arrange for a display of models built by class members or others. These will provide "ideas" as the course progresses.

7. Include an aeronautics foreman in your personnel organization. Makes him responsible for the care of equipment and projects.

Sequence of Models. The success of any model building program depends to a large extent upon the correct choice of models. This is particularly true as regards the first three or four models.

Glider. As has been mentioned before, the first attempt should be a simple glider. This provides an opportunity to learn many of the common operations in model building and with proper adjustment is universally successful. Plans for such gliders may be found in almost any book on model building. The following are typical:

Gordon O. Wilber and Emerson E. Neuthardt, *Aeronautics in the Industrial Arts Program.* New York: Macmillan Co., pp. 30 and 79.

Edwin Hamilton, *The Complete Model Aircraft Manual.* New York: Dodd, Mead & Co., pp. 185-90.

Air Youth of America. *Building and Flying Model Airplanes.* New York: D. Appleton-Century Co., pp. 45-50.

All-Balsa Flyer. If materials are available, the second model should be a solid balsa flyer. The processes involved in this type are similar to those already mastered in making the glider. The most difficult problem relates to carving the propeller. If the model is made from a kit, a machine cut propeller is usually furnished. In this case, it is only necessary to finish shaping, sand, and balance. Where the propeller is to be shaped from a block, however, the beginner should consult some well illustrated text on the subject. (See Hamilton, *The Complete Model Aircraft Manual,* Chapter IX, and Air Youth of America, *Building and Flying Model Airplanes.* Chapter IX). The illustrations show important steps in this operation. The instructor is urged to carve several types of propellers until he has become proficient, and then to demonstrate each step fully and carefully to the class. Plans for solid balsa models are shown in all of the references mentioned above.

Paper-Covered Stick Model. While a paper covered model presents more difficulties than the solid type, it is usually a superior flyer due to its light weight. Care should be exercised in the selection of a model which combines sturdiness and ease of construction. The "Phantom Flash" shown in Wilber and Neuthardt's *Aeronautics in the Industrial Arts Program,* pp. 41-48 and the "Baby R. O. G. Tractor" in Hamilton's. *The Complete Model Aircraft Manual,* pp. 23-4 are good examples. The teacher should build the selected model himself so that he may be able to anticipate any difficulties which may be involved. The problem of how to apply the paper covering so that it will be tight and smooth is especially troublesome to beginners. Read the instructions in any good text and when the technic has been mastered, demonstrate fully to the students.

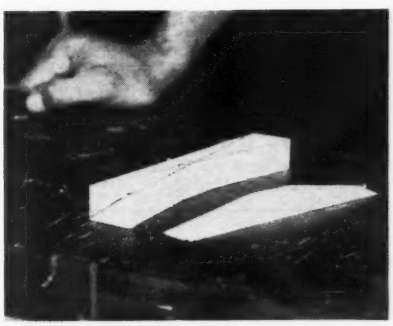
Fuselage or Cabin Model. After successfully completing one or more stick models, most students will wish to build a model which looks like an actual airplane. At this point, a cabin or fuselage type is indicated. *Performance rather than scale models should be encouraged.* The A. Y. A. planes, numbers four and five, are excellent examples. Kits for both of these models may be obtained from most dealers. Plans for other models of this type may be found in Hamilton's *The Complete Model Aircraft Manual,* pp. 398-15, and Wilber and Neuthardt's *Aeronautics in the Industrial Arts Program,* pp. 48-51.

When a boy or girl has completed a series of four or more planes of the type outlined, he will either have decided that he does not like the activity, or he will have become enthusiastic to a point where he will wish to follow his own interests in the choice of further models. He may be the careful, meticulous type who will wish to express his skill through the making of solid scale models. If this is the case, he should be encouraged to go as far as possible in the development of his ability.

If, on the other hand, a boy wishes to concentrate on the building and flying of performance models, he should be given every opportunity to do so. Here lies the open sesame to a mastery of the principles of flight. Once the basic technics of model building are learned, youth requires but encouragement and the opportunity to experiment. Given these and he will more than likely attain through self-study and concentration the knowledge and skills so necessary for living in an "air age".

Hints for Model Builders

Many of the finer points involved in model building must be learned through experience. The writer, however, has found these hints helpful:



Sawing propeller block—next step is to carve blades.

1. Models having round or eleptical wing tips are less likely to warp than square or angular tips. It is often possible to redesign a plane so as to use the preferred type.

2. Pieces of balsa wood may frequently be substituted in the place of bamboo in wing, rudder, and elevator tips. It is easier for students to shape.

3. When making flying scale models, it is frequently necessary to increase the area of the tail surfaces to improve stability.

4. Where possible, when gluing up bulkhead models, place the cement in the notches in the bulkhead before inserting the longerons. They hold better and dry more quickly.

5. Lubricating the rubber motor with glycerine increases the efficiency of the rubber and acts as a preservative.

6. When carving a propeller, a pin should be inserted in the shaft hole before the carving is started. This will be found of considerable help in making sure that the cutting is done on the correct sides.

7. The shaft hole can be made accurately by removing the head from a pin and placing it in the chuck of a sensitive drill press. The marked blank may then be placed on the table and the pin pushed through it by lowering the spindle.

8. When carving propellers, shape the under or concave part first and then carve and sand the convex or top surface to correspond.

9. Give specific demonstrations on how to make wire fittings. This is one of the most difficult processes for students. Make sure that they know the right procedure.

10. When bending wire clips start at the center and work toward the ends. Make cor-

(Continued on page 14)

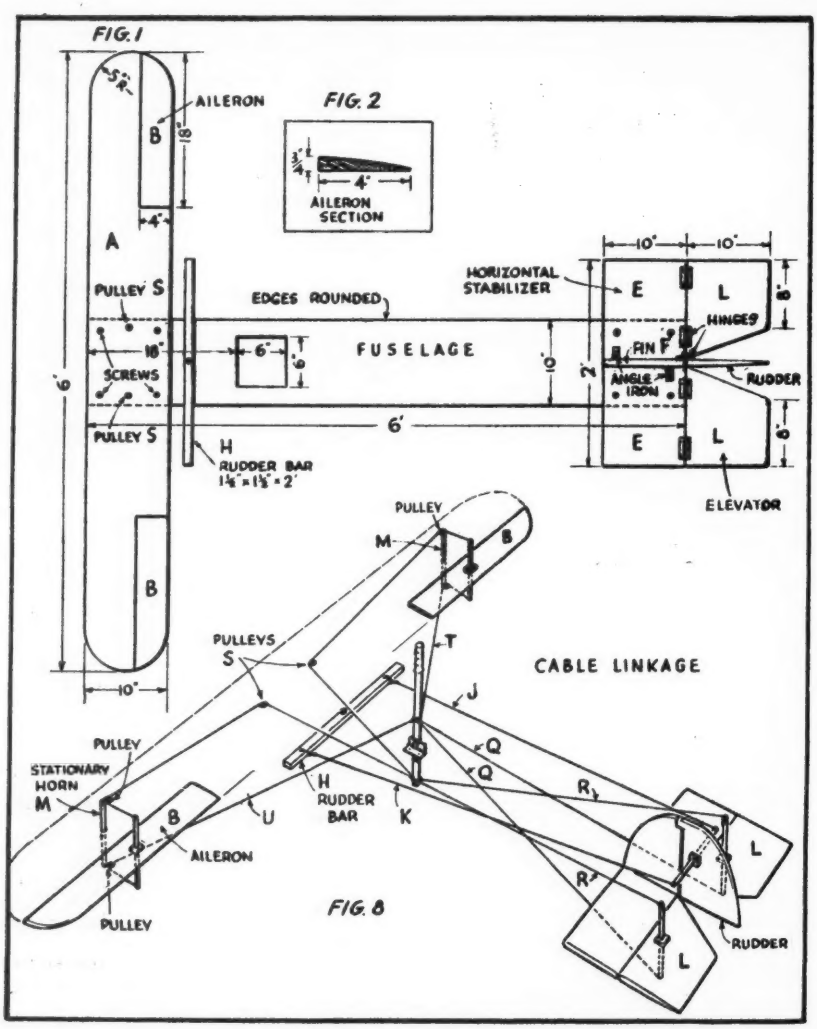
Project of the Month:

Airplane Control Demonstrator

BY *A. Joseph*

This project is admirably suited for teaching the fundamentals of the linkage control of airplanes as well as being an excellent shop project in itself. This device has been used in the preflight training program at the High School of Science, New York City, where the author teaches. This article has been adapted by permission from an instructional job sheet of Popular Science Monthly.

Student operating a preliminary model of the airplane control demonstrator at the High School of Science, New York City.



ALMOST useful piece of equipment in teaching pre-flight training is an airplane control demonstrator. This six-foot model equipped with controls that operate through a simple linkage system is a valuable project for group or individual work.

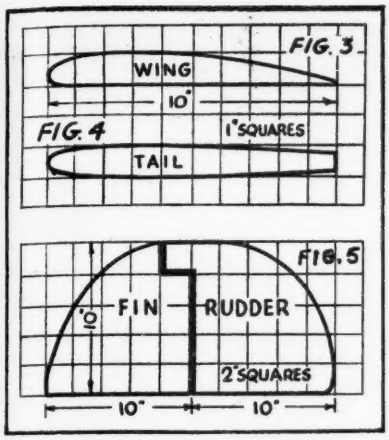
The procedure for making the wing and fuselage is readily apparent from Figure 1. As will be noted from Figure 2, the aileron section is shaped to conform to the wing section (Figure 3).

The two-foot length of tail stock is shaped so that it has the streamlined cross section indicated in Figure 4.

The vertical stabilizer or fin and the rudder are cut from plywood or pressed wood to the shape shown in Figure 5. The rudder section is fastened to the fin section by two hinges, set 6" apart. Allow ¼" between the rudder and the fin when fastening the hinges to permit movement of the rudder to the right or left. Similar clearance should be allowed when fastening the hinges for the ailerons and elevators. The fin is set over the center of the horizontal stabilizer and is fastened by means of two angle irons that are screwed to the tail and bolted to the fin. (See Figure 1.)

The rudder bar *(H)* is held in place by 2½" stove bolt, using a washer, nut, and lock nut so that the bar moves firmly but freely.

Half-inch dowel rod is used for linkage fastenings or horns on the rudder, elevators, ailerons, and wings. Blocks



2" x 2" are drilled and slipped over the horns as reinforcements and glued to the rudder and other parts where horns are used.

The "stick" is cut from 1" dowel and is mounted as shown in Figure 6. Pulleys are used as indicated in Figure 8. A bicycle handlebar grip is used as a convenient handle atop the "stick."

The cable linkage system is shown in Figure 8. Radio dial tuning cable or other flexible but nonstretching cord or wire may be used. Cables are adjusted so that a movement of the stick towards the right causes the right aileron to go up and the left aileron to go down. A movement of the stick towards the left should cause the left aileron to go up and the right to go down.

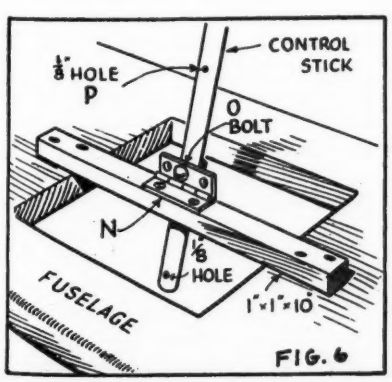
When demonstrating, the following points should be emphasized:

1. Point out the crossed linkage (Figure 8, *QQ* and *K*) from the stick to the elevator. Show that a force applied against the raised elevator pushes the tail down and the nose up. Applying a force to the elevator (Figure 8, *L*) when it is in a lowered position, pushes the tail up and the nose down. Point out that it is the airstream that produces the force when an airplane is in flight.

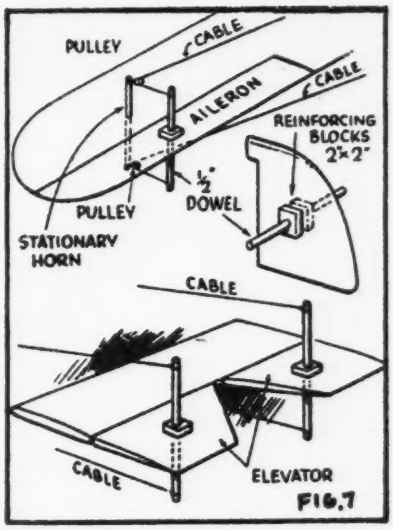
2. Operate the rudder bar and note the movement of the rudder with respect to the movement of the feet of the pilot.

3. Point out the opposite movement of the right and left ailerons (Figure 8, *B*). Show that raising the right aileron and lowering the left aileron decreases the lift on the right wing and increases the lift on the left wing, thus causing the plane to bank towards the right. The opposite movement of the ailerons has the opposite effect.

4. Point out that a plane is banked towards the right for a right turn and towards the left for a left turn, at the same time that the rudder is pressed for the same direction.



The following materials are used: 10′ of ⅞" x 10" wood stock; 8 awning or other type of pulleys; 8 No. 10—1½" flathead wood screws; 24 ½"—⅛" roundhead stove bolts; one 2" flat hinge; two 3" angle irons; ten 1" screen hinges; one 2½"—3/16" roundhead stove bolts with lock washers; 3′ of 1" dowel rod; radio dial tuning cable or other flexible cord or wire that does not stretch; a 3′ x 4′ sheet of ¼" plywood or pressed wood; one 2′ length of 1¼" x 1¼" stock; one 10" length 1" x 1" stock; 6′-½" dowel rod.



Aircraft Drafting at Edison High School

BY *H. B. Young*

**Drafting Instructor,
Edison Technical and Industrial
High School,
Rochester, N. Y.**

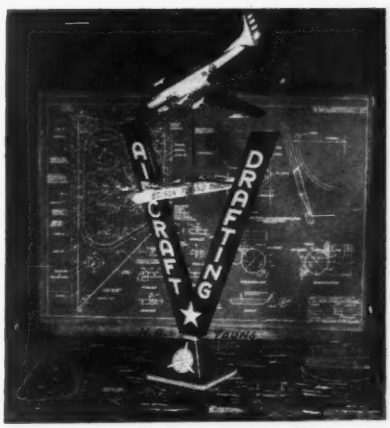
AIRCRAFT drafting is a broad and constantly changing field of instruction. Following is a brief description of the course of study which has been developed at Edison Technical and Industrial High School, Rochester, N.Y., to meet these needs.

An elementary course is given, comprising information on the details and assembly of a small plane. This gives the student the necessary knowledge for drawing of parts and background material for plane repair. Government procedure calls for the drawing of parts damaged in a crash and submission of the drawings and the names of the individuals doing the repairing to government authorities before the plane is allowed to leave the ground.

Following the drawing of the small plane, students study engines, including types, mounting specifications, etc. This is followed by study of landing gears, instruments, and other related topics.

Aircraft design is given for advanced students. This topic includes descriptive geometry, detail design, and fitting analysis.

In teaching aircraft drafting we use models, pictures, drawings, and the "Reflectoscope." The production system is demonstrated by showing various parts in pictorial form together with their relationship to the assembled plane. Knowledge of the rudiments of the production breakdown system is very important to the draftsman.



To create interest in aircraft drafting, Instructor Young designed this "V." It has six plastic planes in single line formation surmounted by a Douglas B-19.

The "Reflectoscope" is used to enlarge small pictures, drawings, and sketches by projection. It is also used to study plane spotting.

Edison Technical and Industrial High School has a ground school so that students in the aircraft drafting classes can see the practical application of their activities.

Ruth Bridge, 29, Steelton, Pa., lifts blade No. 2 off the "spider" while Joseph Drobek, 35, Reading, Pa., holds a spacer block from falling out of the assembly. Blade No. 1 rests on the table at the rear while blade No. 3 remains to be removed. The angle of the blades is changed by the movement of cams in the curved slots of the cage-like assembly next to the blade on the table. Next is the dome cover and to the right is the big hydraulic piston which forces the cams back and forth. Oil under pressure is supplied from the engine to move the piston. After disassembly, the trainees clean, inspect, and re-assemble the parts.

PENNSYLVANIA STATE *School of Aeronautics*

BY *Robert P. Stoner*

THE training program conducted at the State School of Aeronautics in Harrisburg by the Pennsylvania Department of Public Instruction in conjunction with the Middletown Air Depot of the U. S. Army Air Corps has two chief factors which distinguish it from the usual aeronautical schools and the other war-training programs in the country at the present time.

First—the students or trainees are *paid* while learning. They do not pay to learn. Neither do they have to worry about living expenses while learning, for as soon as trainees are accepted for enrolment in the School, they become Civil Service employees of the Middletown Air Depot and receive a salary during their training period. The salary varies from $1500 per year in the case of general mechanics' helpers (individuals having had six months or more of recognized occupational experience) to $1080 per year for learners (individuals having no recognized occupational experience and who are appointed after passing a U. S. Civil Service examination).

The second and other chief difference is that the program of training is under the sole direction, supervision, and control of the State Board for Vocational Education, which has delegated this responsibility to the Division of Industrial Education of the Pennsylvania Department of Public Instruction. These functions are retained by the Division of Industrial Education and are not, in turn, delegated to schools, colleges, or school districts as is the case with the usual war-training program.

Long before Pearl Harbor, as the Army Air Forces were called on to assume an ever growing responsibility, their activities and size grew to such an extent that qualified aircraft mechanics could no longer be obtained. Thus, in March of 1941, in an attempt to supply the demand for qualified aircraft mechanics, the Middletown Air Depot began in-plant training at the Depot on a large scale. By March 1942 it was found necessary to establish a regular shop organization for rapid pre-employment training on a large-scale and full-time basis.

The Farm Show Commission of the State Department of Agriculture agreed to lease the Farm Show Building in Harrisburg for this purpose. It could rapidly be converted for school purposes by the installation of classrooms and equipment. All other facilities were already in the plant. In addition, special funds were available from the United States Office of Education for the vocational education of war-production workers.

Engineering equipment and training personnel began occupation of the building on March 16, 1942. Added equipment, teaching personnel, and training specialists to carry on the program were obtained by the State Department of Public Instruction. At present, the Middletown Air Depot has placed over 30 planes and 40 aircraft engines of the Army combat type, both modern and obsolete, at the School for instructional purposes.

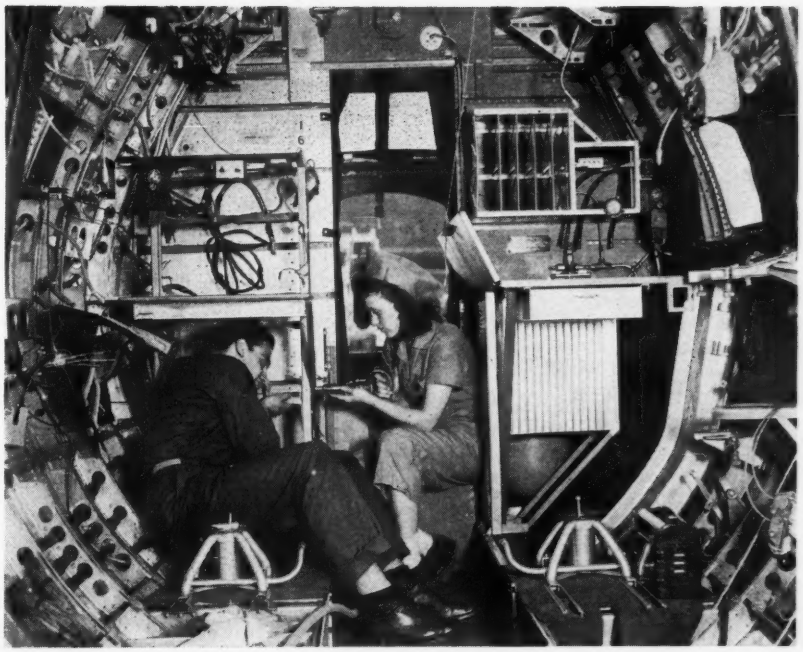
In the six months that have elapsed

Here's the story on the conversion of Pennsylvania's huge Farm Show building at Harrisburg into one of the Nation's largest aeronautical schools. Robert P. Stoner is principal of the school.

this school has given short specialized courses of approximately 14 weeks in 36 classifications of aircraft maintenance occupations. At the peak of enrolment, 4200 people were in training on two shifts. Fifty-two hundred people have been graduated and sent to the depot or sub-depots in the Middletown Control Area. These people were between the ages of 16 and 75, including approximately 28 percent women and 12 percent negroes. There has been no question of placement because these people were already Civil Service employees of the Depot when they reported for training. The employment function has been carried on by the U. S. Civil Service, but occupational placement and training has been the function of the School.

During the first week of instruction trainees are assigned to one of the 36 representative aircraft maintenance occupations in the School. These occupations include engine inspection, sheet metal, engine repair, final assembly, fuselage, instruments, electrical, hydraulic, engine installation, textile and parachute, propeller, machine shop, landing gear, welding, paint and dope, maintenance, aero progress, and stock tracing. The average training period for these occupations is 14 weeks. Instruction is given in the manipulative skills of the occupation, as well as related skills including blueprint reading, mathematics, and theory as it relates to the occupation. Approximately 65 percent of the training period is devoted to practical instruction while 35 percent is devoted to related instruction.

In the event that a trainee is found incapable in one occupation, he may be transferred to another for a try-out period. To be graduated from any of the 36 occupations a trainee must complete the prescribed curriculum for that occupation with an average grade or better.



Domenic Pescatore, 17, Brooklyn, N. Y., holds a bucking bar as Jeannette Kline, 21, Wilkes-Barre, Pa., operates a pneumatic rivet gun to install a replacement brace for the radio operator's table. They are working inside the fuselage of a Martin B-26. The table on the right is for the ship's navigator. Pigeonholes above are for maps and charts. Pilot's compartment is up ahead. Note lunch box in right foreground. Many trainees carry their lunches while others patronize the large cafeteria located in the building.

On the completion of the training period in the School, trainees are sent to the Middletown Air Depot or to one of its sub-depots where they are put on production work in the occupation of aircraft maintenance for which they were trained.

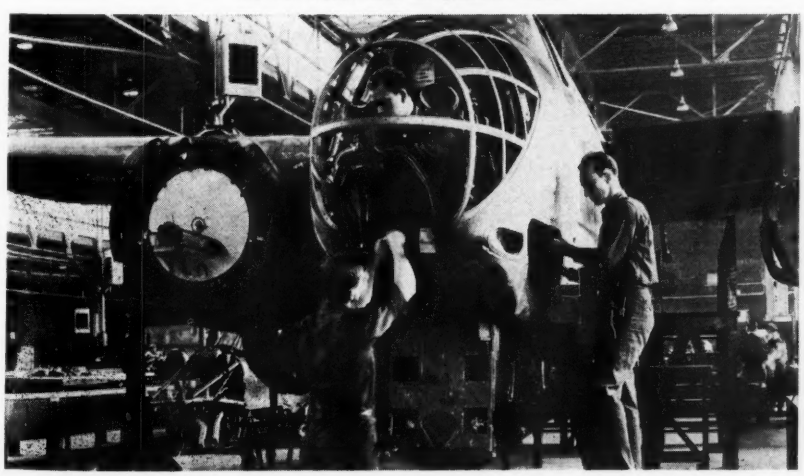
The teaching staff of the Pennsylvania State School of Aeronautics is composed of 315 practical instructors and 48 related instructors. The practical instructors on the staff have had recognized successful experience as mechanics in the aircraft maintenance occupations in which instruction is being offered and have successfully completed specialized courses of instruction given during a six-week teacher-training period in the school; or have had at least two years of trade experience in a closely allied occupation and have completed the prescribed specialized courses in the occupations to be taught.

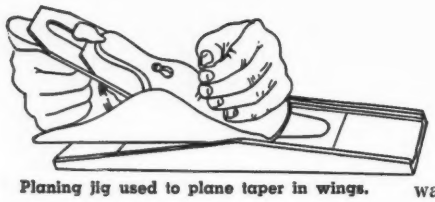
Related instructors possess two or more years of recognized trade experience and professional certification in the subject they are teaching. Both practical and related instructors in the different occupations closely coordinate the manipulative skills of the occupation with the technical skills, thus necessitating that the related instructors be familiar with the operations performed by the trainee in the shop. This teacher training is given to related teachers when they become members of the staff in preparation for their assignment.

The staff of practical instructors is composed of approximately 30 percent state personnel and 70 percent Civil Service personnel loaned by the Middletown Air Depot, while the related instructors are all state employed. Although instructors are employed by two different agencies, there is no distinction

(Continued on Page 20)

Harry Rosenthal, 26, Fort Lauderdale, Fla. (inside greenhouse), installs new wires connecting the bombardier's controls to the bomb rack with the assistance of Billy Gilber, 19, Cressona, Pa. John Kerns, 27, Harrisburg, Pa. (right), is repairing a circuit controlling a machine gun. This Douglas A-20-A is used by classes in electrical wiring and installation for trouble shooting by advanced trainees. Note motor attached to bracket on nacelle at left. The belt drives the regulation generator and this set-up is used to check out and trouble shoot the generator circuit.





Planing jig used to plane taper in wings.

Model Planes on the Production Line

BY *George Merdutt*

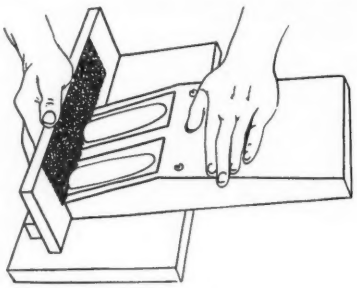
Detroit, home of assembly-line methods, has applied the technic to model production, utilizing special jigs and fixtures. George Merdutt teaches at Munger Junior Trade School where he had charge of final assembly.

IN March, 1942, the schools of the Nation were called on to undertake what was probably the largest and most important job ever assigned to their industrial arts shops. This was the construction of model airplanes, of over 50 different types, for use by the United States Navy in the training of its personnel.

The first requirement was making templates, both male and female, for checking the various parts before they were to be assembled. These were made very accurately so that fuselages, wings, tail surfaces, etc., could be checked to very close limits, assuring proper fits of all parts in their respective places in the assembly jigs. This work was carried on as in a large industrial plant, the parts moving along a definite route to the final assembly, where the plane was ready for painting. Accompanying photograph and sketches show clearly the making and assembly of the parts.

In Detroit the Munger Junior Trade School was designated as the assembly center. Other schools in its district were assigned to make parts, which were forwarded to the Munger School for assembly into the finished model. This school, however, found it necessary to make parts also for the assembly line.

The specifications demanded that they be built to an exact scale of 1/72, and they were to be held to a tolerance of 1/32″. This difficult task was started and carried out in the shops amidst priorities and shortages.

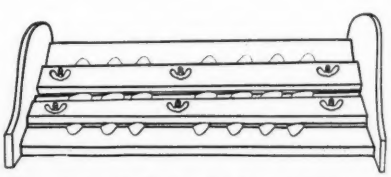


Sanding dihedral angle in wings.

The various jigs and fixtures were mostly the work of the students. As many as space would accommodate were placed in line with each other to facilitate assembly. In one instance eight assembly jigs were side by side on a ¾″x8″x8′-0″ board, permitting eight planes to be assembled at one time. Using a slow-setting waterproof glue, it was possible to glue and assemble about 16 to 24 planes per day, contingent on the flow of necessary parts.

For each different type of plane it was necessary to have a different set of jigs for final assembly. Since various parts also differed, subassembly jigs had to be constructed to handle minor assemblies.

Throughout was emphasized the educational value to the students, who could see, construct, and handle the various parts, and observe them become the finished product. They learned the importance of the breaking down of the assemblies; became familiar with the most common terms; and realized the necessity for exercising care and extreme accuracy in construction of the large number of parts. The more qualified students were selected as foremen in charge of such duties as: checking on the construction of parts; construction of jigs and fixtures; routing of materials; and final checking for line-up in the jigs.



Wing assembly jig showing how a large number of wings are held while glue sets.

A very interesting idea was worked out for the making of the various small surfaces such as elevators, rudders, air scoops, etc. It was found that solid stock for use in making the tail surfaces was very fragile and warped very easily after being glued into place. We were able to obtain 1/16″ waterproof aircraft plywood which was glued together to make whatever thicknesses were wanted. Stacks of this glued-up material were cut to a knife line on the

Douglas A-20A light bombers ready for painting with subassembly chart in background.

jig saw, requiring no further sanding to fit the template. Then the airfoil section was sanded on the particular surface, using narrow sticks with garnet paper glued to them. As the sanding progressed, each separate ply was exposed and compared to the opposite side; in that way the streamline surfaces were maintained the same, and the various parts lined up properly in the jigs. Air scoops were made in a similar manner. A metal template was made for a group of six or more scoops and the outline very carefully scribed on stock which had been bradded together in layers, and very carefully cut so that the finished product required very little or no final sanding.

After the planes were assembled came the job of finishing. The instructions were to undercoat the planes with a suitable undercoating and then to use a dull black finish, so the models would be as free from glare as possible. Many undercoatings were tried, and it was found that with some, which had been sprayed over an inferior coating, the final coat began to blister and break off. After many experiments and failures with various finishes, a dipping enamel was discovered which showed no laps, brush marks, or imperfections in the final finish. This enamel was absolutely dull black, and, on being inspected by some of the officers of the United States Navy, was pronounced very satisfactory. Ultimately all the planes which were received from the various centers in the city were dipped with this finish. The students dipped and hung these models, using production-line methods, one dipping, one handing, another checking, and still others labeling and packing, so that when this operation was finished the planes were ready for delivery.

As the Munger Junior Trade School operates on an 11-month schedule, the other centers in this city sent all their airplanes to this school, at the end of June, to be inspected, checked, labelled, and packed in groups for delivery. Some needed repairing, so a group of boys was set to work at this job.

While the entire quota of planes was not filled, those that were delivered were very acceptable, and could be used for the purposes intended.

In the final analysis the program was very educational for the students, who learned the problems of assembly, also the problems of subassemblies and small units which go to make up the final project.

VISUAL AIDS
for use in
AVIATION EDUCATION

A unique control-demonstrating device. Control surfaces can be adjusted for any flying attitude, by moving joy stick and rudder pedals. Offered in completely built-up form, made of sturdy hardwood. $4.75 (Inc. Shipping charges)

The COMET WIND TUNNEL

Priced remarkably low, yet embodies many features of a full-scale tunnel used for experimental work. Designed for use with any 16" fan. Includes honeycomb, built-in windows at sides and tops. Supplied in knock-down form, readily assembled. A number of test models supplied. Write for price and details.

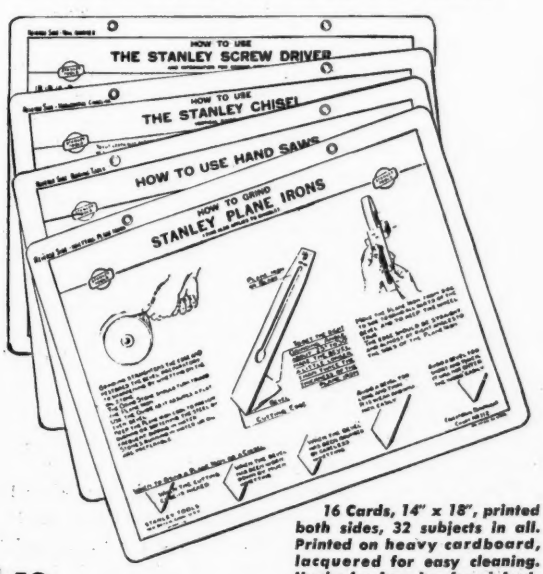
WRITE for NEW CIRCULAR
Describing These and Many Other Visual Aids

Circular now in preparation describes above models in detail, and many other models, gliders, etc., for classroom use in aviation education courses, easily correlated with various aviation texts.

COMET MODEL AIRPLANE & SUPPLY COMPANY
Dept. SI2
129 W. 29th St., Chicago
559 Sixth Ave., New York

Save Time in teaching Tool Care and Use

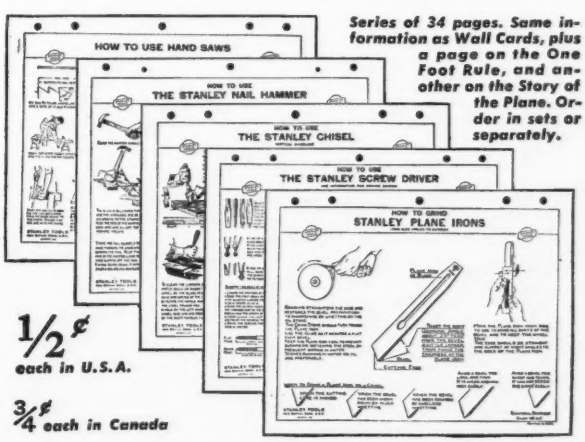
—with STANLEY WALL CARDS



16 Cards, 14" x 18", printed both sides, 32 subjects in all. Printed on heavy cardboard, lacquered for easy cleaning. Hooks for hanging furnished.

$1.50 *per set Delivered anywhere in U.S.A. (2.25 per set in Canada)*

—with STANLEY NOTEBOOK PAGES



Series of 34 pages. Same information as Wall Cards, plus a page on the One Foot Rule, and another on the Story of the Plane. Order in sets or separately.

1/2¢ *each in U.S.A.*

3/4¢ *each in Canada*

These Stanley visual teaching aids are essential equipment in hundreds of school shops. Presenting tool facts with few words and many illustrations, they reduce the time necessary to explain each tool to a minimum, and are constant reminders of proper practice. Offered at our cost for printing and postage. Order sets for your shop today. Complete list of subjects sent on request.

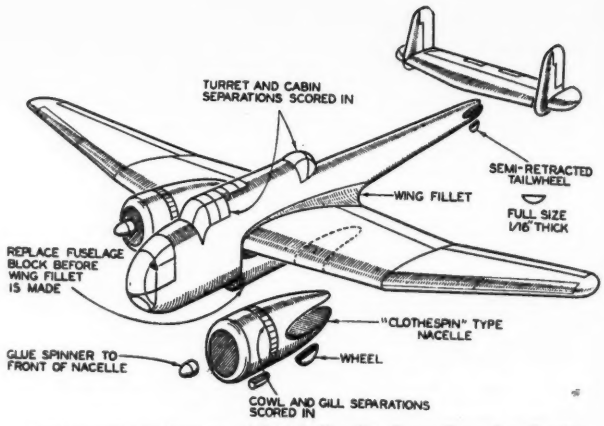
WRITE for a copy of Stanley Tool Catalog No. 34 — "The Encyclopedia of Tools" — sent free on request.

STANLEY TOOLS
DIVISION OF THE STANLEY WORKS
EDUCATIONAL DEPT., NEW BRITAIN, CONN.

FROM THE WASHINGTON SCENE:

"Clouds" of Model Airplanes

BY *Ben Brodinsky*


TURRET AND CABIN SEPARATIONS SCORED IN
SEMI-RETRACTED TAILWHEEL
WING FILLET
FULL SIZE 1/16" THICK
REPLACE FUSELAGE BLOCK BEFORE WING FILLET IS MADE
"CLOTHESPIN" TYPE NACELLE
GLUE SPINNER TO FRONT OF NACELLE
WHEEL
COWL AND GILL SEPARATIONS SCORED IN

Final-assembly drawing of British Handley-Page Hampden Bomber.

ALTHOUGH many schools are still working on model planes originally requested in January, 1942, new planes are coming into military importance with such rapidity that models of 30 new types are needed immediately for military and civilian-defense training. The Navy requests 10,000 models of each type.

Template and assembly sheets for 10 different types of models have already gone out to the Nation's schools—and shops are gearing for another big war job.

So far, plans and drawings have been issued for the following:

United States: Curtis SO3-C, Navy Observation Seaplane; Vultee A-31, Army Dive Bomber.

German: Focke Wolfe 190, Fighter; Dornier DO-26, Patrol Bomber.

Japanese: Mitsubishi 97 ALB, Army Light Bomber; Mitsubishi 98 ALB, Army Light Bomber; Mitsubishi 98 ALBR, Army Bomber and Reconnaissance Plane.

British: Short Stirling, Heavy Bomber; Handley-Page Halifax, Heavy Bomber.

These planes are to be known as Series D. Plans for 20 planes in Series E and F are to be announced soon.

U. S. Office of Education officials recommend that each state assume a quota at least equal to 60 percent of the number of planes assigned to it last year. However, one thing is certain—the demand from the armed forces and civilian-defense agencies for model planes is such that schools may make as many planes as they wish—and there can not be too many planes.

Key figure in the development of the new series of planes is the local director of the model aircraft project. Without enthusiasm and willingness to take on an extra job for victory, and without the help of pupils, parents, teachers, and civic groups—the local director of the model project may have a difficult time. If demands for plans in his community exceed the supply given him by the Navy or the U. S. Office of Education, the ingenious local director will have to find ways to blueprint or photostat additional copies. He must take particular care to maintain exactly the same scale size.

He will also have to supply materials at local expense. If the wood, glue, blueprints, etc., are not available through the school system, the enthusiastic local director will find ways to "get the goods" through the help of civic groups or airminded individuals in the community.

It is at this point that publicity becomes important in the conduct of this project. By informing the people about the progress of this undertaking, local directors will not only attract large numbers of youth, but may also smooth the way for community help in buying necessary equipment and materials.

Some local directors prefer mass production to individual methods of model-building. Either method is acceptable to federal authorities. However, they urge that students should be discouraged from "going after the easy" models. "Each student," says the Office of Education, "should be encouraged to make as many different types as he can." At least one boy, a Texan, has been known to complete 69 different types of models. Three others have built 50 types each. These boys carry the title of "Admiral Aircraftsman."

Each local director appoints an inspection committee, whose job is to approve model airplanes before they are shipped to the military authorities. In many communities, tool and pattern makers, cabinet makers, and other skilled craftsmen serve on the inspection committees. In large school systems, there may exist as many inspecting committees as are necessary. Each committee establishes its own tolerances, but they are scrupulous in making certain that every model shipped for training purposes complies strictly with specifications in detail.

After models are inspected and approved they are packed and shipped to designated authorities. Packing must be done under the supervision of an adult appointed by the local director. *Only authorized shipments, prepared in approved manner, are accepted by military and aeronautic authorities.*

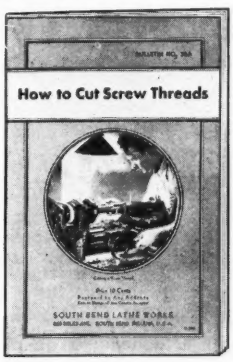
Students who make acceptable models are given certificates of award. These certificates indicate the rank of the aircraftsmen. Thus, a boy completing one type of model is given the rank of Cadet Aircraftsman. Other grades which may be earned include: ensign (3 types of models); lieutenant, junior grade (5); lieutenant (7); lieutenant commander (8); commander (9); captain (10); rear admiral (25 models, each of a different type); vice admiral (40); and admiral (50).

Latest reports available show that about 360,000 youths in 6,000 schools have participated in the aircraft project. About 200,000 models are already in use. If needs of the military and civil aeronautics stations are to be satisfied, new "clouds of airplanes" in model form, must be rushed to completion in the school shops of the Nation.

. . . news from INDUSTRY

For items listed in this column, readers may address the firm named or write to News from Industry Dept., SCHOOL SHOP, Box 100, Ann Arbor, Michigan.

Cutting Screw Threads Covered in South Bend Book



South Bend Lathe Works announces reprinting of its 21-page booklet on *How to Cut Screw Threads*. First part of the book covers setting up the lathe for thread cutting. This includes the use of the quick-change gear-box to obtain pitch of thread desired.

Complete information is given on the several types of lathe tools used in thread cutting, how to grind them, and how to mount and position them on the lathe. Copies of *How to Cut Screw Threads* may be had from South Bend Lathe Works, Dept. S5, South Bend, Ind., or from SCHOOL SHOP.

2000 Reels in Use of "Inside of Arc Welding"

Reports from vocational schools, Army, Navy, and industrial centers indicate widespread use of General Electric Company's film, "The Inside of Arc Welding." More than 2000 reels of the film are in use throughout the United States.

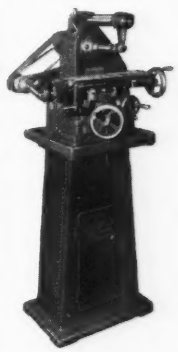
Made in full color and sound, six independent reels constitute the "Inside of Arc Welding"—presenting clearly and entertainingly the fundamentals of arc welding. Further information may be had from the General Electric Co., Dept. 6-215SS, Schenectady, N. Y., or through SCHOOL SHOP.

Sheetmetal Equipment Described in Bulletin

Bulletin No. 103-C, issued by the Niagara Machine & Tool Works, Buffalo, N. Y., describes and illustrates their complete line of sheetmetal working equipment. To assist in planning the efficient school sheet metal shop, the bulletin also includes typical floor layouts to accommodate various size classes, together with lists of equipment needed to fit each layout. Copies of the bulletin are free and may be had by writing the company or SCHOOL SHOP.

Jefferson Makes "Bulldog" Precision Milling Machine

For instruction on fundamental milling-machine practices is the "Bulldog" precision miller made by Jefferson Machine Tool Co., Cincinnati, Ohio. The milling machine is made in either hand or power feed, and in bench and floor models. Ease of operation and accurate production to close tolerances are stressed for the machine, which will handle a large volume of milling-machine work. Information and specifications on the machine may be obtained from SCHOOL SHOP or direct from the manufacturer.



Enlist now . . . in the

Schools at War PROGRAM

to encourage students to . . .

★ **save to buy War Bonds**

★ **serve their community and nation**

★ **conserve material for the war effort**

GET YOUR *Schools at War* HANDBOOK FROM YOUR SUPERINTENDENT NOW

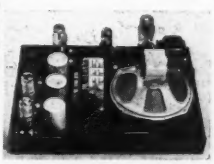
★

SPONSORED BY THE WAR SAVINGS STAFF OF THE TREASURY DEPARTMENT AND THE U. S. OFFICE OF EDUCATION

Lafayette has complete stocks—ready for immediate delivery! Nationally known radio, electronic and sound equipment available for all Military training courses. Lafayette equipment is in daily use by technical schools handling Military training courses including Signal Corps Schools. Write for FREE technical advice—our engineers are at your service.

TEACHERS—Write Dept. 12D2 for FREE 130-page general catalog and Instructive Public Address Catalog listing all P. A. Units. These Free catalogs are an invaluable Teacher's Guide.

A number of kits in one are provided by our 7-tube demonstration kit (illustrated). It can be built in stages, each stage interconnected with tip jacks. When completed, there are 2 stages of RF, a detector stage, an audio driver stage, a beam power push-pull audio and a power supply. The circuit diagram will suggest many interesting uses.

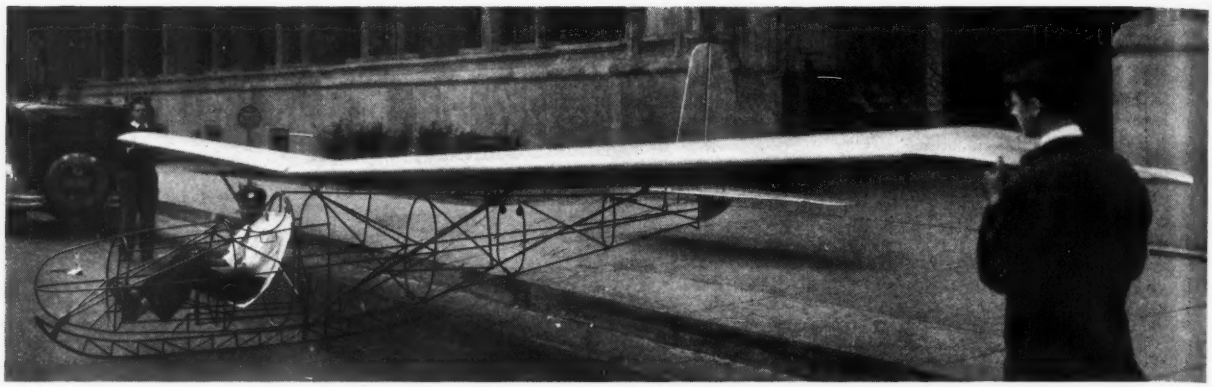


LAFAYETTE RADIO CORP.

901 W. Jackson Blvd., Chicago, Ill.

265 Peachtree St., Atlanta, Ga.

Full line of Cameras and equipment at money-saving prices—ask for FREE PHOTOGRAPHIC CATALOG!



Aviation Education IN SCHOOL SHOPS

BY *Merrill C. Hamburg*

An integrated program in aviation from the elementary school through the fourth year of high school with the responsibility greatest for shop teachers is called for by the author who is supervisor of vocational education in the Detroit, Michigan, schools and is the "father of model building." Nearly 20 years ago through the American Boy Magazine, Mr. Hamburg began arousing the interest of youngsters in airplane model building.

THE air-conditioning of youth is the responsibility of the entire school. Each department must contribute its share if the aviation program is to succeed. The program should start in kindergarten and continue through high school. Aviation material must be woven with care into the present courses of our curriculum. Nomenclature and identification will be taught in the grades. Literature classes will read the stories of aviation; the geography classes will explore the globe and the skyways; and the biology of flight will be learned in biology classes. A greater emphasis must be placed on the need for mathematics, sciences, and the social studies if our children are to be ready to take their places in the post-war period.

But probably the greatest responsibility of all will rest with the vocational and industrial arts teachers. Theirs will be the job of training the boys and girls in the many aviation skills. They must be sure that in addition to the manual skills the pupil must have a thorough understanding of the principles of aviation which lie behind these skills. This training should begin as soon as the child enters his first shop class.

Let us examine the possibilities for an aviation program within the vocational department. If the boy enters his first shop class during the sixth or seventh grade, the vocational department will have him from five to six years before he graduates from high school, assuming that he elects to take an aeronautical course.

Since we are more concerned with the later years we will not discuss in any detail the program of the grade-school youngster. It should be pointed out in passing that very few sixth- or seventh-grade pupils develop sufficient manual skill, patience, or the physical coordination necessary for the successful construction of flying models. To attempt to build them is very apt to permanently discourage many potential champion model builders. There are, however, many projects of an aviation nature that are readily adaptable to this level of shop skill. Model airports, complete with hangars, towers, runways, and planes; solid scale models; soap box airplanes on cart-wheels for the younger brother or sister; rigidly constructed airplanes which can be flown with the aid of a fish pole and line; and many similar objects of a toy nature can be easily constructed by this age boy. They will all serve to whet his appetite for things aeronautical and at the same time may be used to give him an ever-widening knowledge of the types and kinds of airplanes, their identification and use, and to add to his vocabulary much of the nomenclature of the airplane.

Beginning with simple flying models in the seventh grade, the intermediate-school boy develops a skill which usually reaches its peak during the ninth grade. It is with this age group that the model airplane program is more apt to have success. Unfortunately, the high-school boy who continues to build and fly model airplanes is often subjected to much depreciation to the point of ridicule by both adults and his schoolmates. This lack of understanding has had a tendency to make most boys feel that on entering senior high they have become too old to play with models and so they transfer their interest to the large planes. Here, however, they clash with parental authority as both dad and mother definitely feel that he is too young to even think of flying and so we have an impasse which usually results in the boy drifting off to other interests and hobbies. A few will continue with models regardless of the opinions of their fellows and, in cases where they can financially afford it, graduate into gas-powered models and finally into flying.

The school program should be planned to avoid any period of inactivity that might cause the boy to lose interest. This may be done by planning a continuous model-airplane program that extends from the intermediate grades into the high school. Beginning high-school pupils can be encouraged to continue with model building by providing special contests for them, requiring more technical knowledge and research. The following examples are illustrative of the type of contest that seems to be indicated for the senior high-school student:

1. A contest planned to select the most efficient airplanes. The models being designed around a weight-carrying formula involving power available, total

Above—Soaring glider designed and built by members of Detroit's Cass Technical aero classes in 1929. Many successful flights were made in this glider. Right—Navy model builders cleaning planes and applying fairings preparatory to painting. Note assembly jigs on table and metal templates on board.

wing area, and the fuselage cross-section.

2. A contest for radio-controlled models.

3. A contest for power-driven ornithopter models based on insect flight.

4. A contest based on the ability of rubber driven models towing one or more gliders.

5. Duration contests for *soaring* model gliders.

The last contest has many possibilities as it encourages both efficiency in design and the study of meteorology.

The mortality of regularly organized school model airplane clubs and classes has been so high that many school people have become discouraged to the point where all model airplane work as a school project has been completely dropped. What is the answer? We know that regardless of whether they are sponsored by the school or not young boys continue to build countless model airplanes. Let us examine the picture a little more closely.

First, we have to have teachers who are interested enough to spend a great deal of time with the boys actually building model airplanes. The writer has yet to learn of a successful model class sponsored by a teacher who couldn't make flying model planes himself.

Good model builders, as a rule, dislike to build their models in a crowded classroom. They prefer to work at home. To be sure he will bring parts to class to work on, and he will bring completed models to school to fly, but when it comes to the actual assembling of his planes, he prefers to do that at home alone, where he isn't always in fear of someone bumping into his work and destroying it.

The classroom then should be reserved for instruction in the making of parts, the theory of design, the adjusting of flying models, and the principles of flight. Workmanship of a high degree should be stressed. If model builders are taught that only the perfect piece is good enough to become a part of their planes they will soon astound you with the excellence of their workmanship. I have seen intermediate-school boys taking off the dimensions of airfoil sections and laying the templets out with vernier calipers to one-thousandths of an inch. I have watched a boy build up a hollow spar, using a micrometer to check the thickness of each part to one-thousandth of an inch. You may say "that is all foolishness" and I could only answer by pointing to their performance. When ten boys out of a class of twenty can win seven places in a national model airplane meet, two of them with firsts, it is more than just an accident. Furthermore, this desire for accuracy becomes a mania and weaves itself into every activity of the boy.

Where conditions are favorable the inclusion of a glider program for the eleventh-grade student will do much toward the rounding out of the aviation program. Gliding is not dangerous when properly supervised. Only licensed instructors using approved machines should be considered. Under these conditions a boy is in less danger in a glider than he would be riding his bicycle on the city streets.

Pupils participating in gliding would, of course, be required to study aerodynamics, controls and stresses on airplane structures, and aeronautical meteorology. The school shops could be encouraged to engineer, design, and build gliders which would be eligible for C.A.A. approval.

Much has been written in the last few months about the high-school preflight aeronautics classes. These classes will do much to give us an informed student-body but they should not be considered as a substitute for an aviation program. Designed to give preliminary training to students who on graduation will become candidates for flight officer training, pre-flight classes must not be confused with the training recommended for ground-crew personnel. Commissioned officers in the ground-crew are expected to have not less than two to three years of engineering training of a college level. Noncommissioned officers and enlisted men are employed chiefly in occupations required of mechanics who are called on to service planes and their equipment. The skill required from the latter can only be obtained by years of experience. Former automobile and industrial mechanics make the most likely candidates for these positions after a period of intensive training by the Army.

Pre-flight aeronautics has two definite aims as follows:

1. A material reduction in the time required by the army and navy for preliminary flight training.

2. A reduction to a minimum of the failures among the candidates.

It is hoped that the high schools will help to realize these aims by providing their pupils with the ability to perform quickly and accurately the fundamental operations in mathematics, give them a working knowledge of physics, and a thorough understanding of the principles of flight.

The objectives of the pre-flight aeronautics course are very definite and are aimed to serve a military need. The high-school aviation program must be much broader. It should serve the whole field of aviation. Outlines for such courses can be obtained from any number of school systems that have maintained successful aviation curriculums in their high schools for years. The purpose of this article is not to set up any one course of study but rather to point out the desirability of integrating the whole program from the elementary school through high school.

Model Building

(Continued from page 3)

responding bends alternately on each end. "Sight" work carefully before making each bend to be sure it does not go "out of line."

11. When adjusting wire fittings, start at the middle point and straighten one part at a time until all are in the same plane.

12. Wheel bearings for sheet balsa wheels may be made by gluing a bead on each side of the wheel. This prevents "wobble."

13. When covering the wings on small models, only the leading and trailing edges and the ends should be doped. Doping each rib tends to make the wings warp.

14. Use a new, sharp razor blade to trim paper along edges. Keep the blade for this purpose only. Hold wing or other part in one hand and adjust angle of blade until perfect cut is secured.

15. Make template for propeller blade so that both ends will be the same shape.

Suggestions for Club or Contest Activities

An important factor in mantaining interest in a model-building program centers about contest and similar club activities. Unusual incentive to study about and master the principles of model design and principles of flight seem to result from such activities. The following hints have been found helpful:

1. A certain number of formal contests should be run each year. These should be carefully organized and conducted under the rules of the Academy of Model Aeronautics.

2. Winners in local contests should be encouraged to compete in sectional and state contests.

3. A program of informal contests should also be sponsored. These should be of such a nature that every model builder will have an opportunity to participate.

4. Give full school and community publicity to these contests. Recognize winners by bulletin board notices, newspaper stories and pictures. Solicit prizes from local service clubs, etc., if possible.

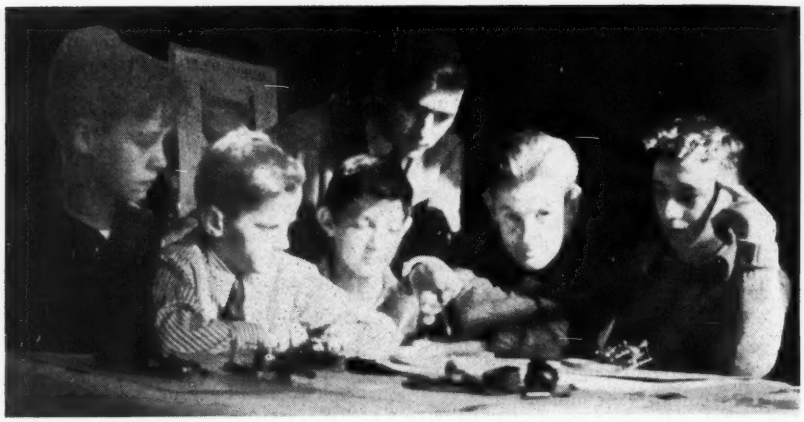
5. Vary the type of contest. Some of the more common variations are balloon-breaking contests, acrobatic contests, R. O. G. contests, glider distance, glider endurance, spot landing, speed contests, nonflying models, etc.

6. Develop a club or school emblem. This may be printed and pasted on finished models.

7. Have certificates of award for all models which win or place in any contest.

Teacher Preparation

One of the most serious obstacles to the introduction of an extensive program of model building in American schools relates to the fact that many industrial arts teachers feel that they are not prepared or experienced enough to undertake the work. Experience seems to indicate, however, that wherever a teacher has *conscientiously* tackled the problem, the job has been well done. It is urged that teachers develop their interest and skills through the actual making of models. Start with a simple glider and *gradually* progress to more complicated types. Take advantage of the experience and knowledge of any students who may be in the class.



The author demonstrating clock assembly to shop students.

Aircraft Instruments
and the Industrial Arts Shop

BY *Joseph H. Quimby*
INSTRUCTOR, AIRCRAFT INSTRUMENT SCHOOL, PATERSON, N. J.

A LOT is heard lately about a program to include airplane and glider construction techniques in the industrial arts shop. But how many times is heard mention of the instruments that go into these planes? In every glider there are at least four instruments, and in each plane at least a dozen, and more likely two dozen. Yet little is seen about developing those techniques especially required for instrument installation, maintenance, or making. We are constantly reminded of the fact that for every plane in the air, there are 34 men on the ground. Among the most important of these are the instrument specialists. Just what can the shop teacher do about it?

First, he can make a study of the instruments himself, either by reading good books on the subject or by actually studying in a technical school that specializes in this work. He soon will find the technique not far removed from that of watch and clock repair work. He'll also find it necessary to study meteorology, physics, and flight theory. Armed with these subjects plus a thorough knowledge of general mechanics and mechanical drawing, he can soon prepare himself for preliminary lessons on instrument theory.

To develop technique of delicate skill with fragile instruments, the instructor can best start with an alarm clock. Take it apart, clean, oil, and reassemble it. Do this many times. Techniques aren't built up in a day. You'll be all thumbs for a long time, until, all of a sudden you'll find it exceedingly simple to do this operation. You are then ready to try a more delicate one. Secure a cheap "dollar" watch, disassemble it, clean and oil it, and reassemble. Repeat this as often as you feel necessary. Unless you can practically do it blindfolded, you are not good enough to demonstrate the process to others.

Substitutes for aircraft instruments are plentiful. The oil gauge of an auto, the ammeter, fuel gauge, and speedometer greatly resemble similar instruments in a plane. The speedometer, of course, resembles the tachometer while the others are exactly like that of an airplane. The thermocouple of a plane and a motor heat gauge are exactly alike; both are vapor thermometers. An aneroid barometer has all the working parts of an altimeter except for the fact that it is calibrated differently. An air-speed indicator is like an altimeter except that it has a static air tube connected to it. An electric thermometer is similar to an inexpensive pyrometer. A small steam- or air-pressure gauge resembles an oil-temperature or fuel-pressure gauge. The mechanics are exactly alike. A voltmeter and a rheostat are all that make up a simple fuel gauge, and so on. An instructor with ingenuity can easily find substitutes procurable, if he knows what the instrument itself is like. This can be found in *Aircraft Instruments* by Irwin, published by the McGraw-Hill Book Company.

Technique, plus theory, and you have the ability to build a sizable course of study that has definite value, not only now, but after the war.

An Entirely New Book

"Reading Aircraft Blueprints"

Different from all other aircraft blueprint books.

Goff and Novak

All drawings are of a modern plane, prepared to scale specifically for this book—*not reduced from obsolete prints gathered at random from aircraft companies.*

Other Features . . .

1. The book contains 5 blueprints giving a progressive view of main sections—fuselage, wing, stabilizer, elevators, vertical fin and rudder; 23 blueprints of sheet metal aircraft parts; 7 blueprints of standard aircraft parts (rivets, bolts, etc.); 10 blueprints of forgings, casting and machined parts; and 5 large blueprints showing the assembly of all parts into the completed plane to enable the student to visualize the placement of each part in the complete plane.
2. 80 page question book attached. Arranged for student to answer 10, 20, or 25 questions on each blueprint. Makes point grading easier. Answers arranged for quick checking.
3. Discussion of blueprints as they are used in aircraft industry.
4. Section devoted to fundamentals of reading working drawings for students without mechanical drawing experience, followed by discussion of blueprints in aircraft industry, aircraft terms and abbreviations, etc.
5. Tables and charts used by the aircraft worker.

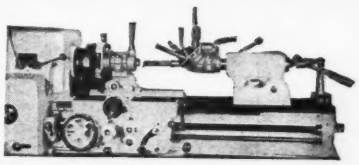
Written by Goff & Novak, aeronautical engineers actually engaged in aircraft production and in teaching night school training classes. Former navy and high school instructors.

Price $2.00 — Approval Copy on Request

McKNIGHT & McKNIGHT

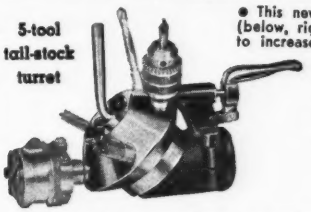
Publishers, Bloomington, Illinois

ANY ENGINE LATHE CAN BE CONVERTED INTO *A Turret Lathe* IN 15 SECONDS



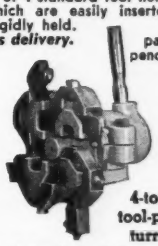
Train TURRET LATHE Operators on your ENGINE LATHE

Photo shows turrets applied to 16" lathe



5-tool tail-stock turret

● This new modern TOOL-POST TURRET (below, right), made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard tool holders which are easily inserted and rigidly held. ***6 days delivery.*** pat. pending



4-tool tool-post turret

● Then there's the completely modernized 5-tool TAIL-STOCK TURRET (above), made in 4 sizes to fit small bench lathes and lathes up to 24" swing. Also the adjustable PULL-FEED LEVER. All tools are precision made attachments which will convert any engine lathe into a production turret lathe. *6 days delivery.*

Jefferson Turrets are real production tools—substantial, rigid, accurate, and adaptable to any size or make of engine lathe. They must not be confused with small makeshift gadgets now on the market.

Write for a bulletin of these and other JEFFERSON TOOLS!

JEFFERSON MACHINE TOOL CO.

667-687 W. Fourth St., Cincinnati, Ohio

We also manufacture milling machines, milling machine attachments, dividing heads, vises, belt sanders, swing-frame grinders and gyratory foundry riddles.

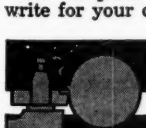
KENNAMETAL*

KENNAMETAL leads the steel cutting carbide field because of its ability to produce more finished jobs per regrind and more steel per tool life. STYLE 3

This ability is achieved by a combination of outstanding cutting tool characteristics of hardness, higher transverse rupture strength, long-wearing, and crater resistance.

In addition, KENNAMETAL tools will take jump cuts and will machine steels up to 550 Brinell hardness at economical speeds and feeds.

For complete information on these superior cutting tools write for your copy of the Vest Pocket Manual.



McKENNA METALS Co.

274 Lloyd Avenue, Latrobe, Penna.

Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
Exclusive of Canada and Great Britain

GLUES for WOOD PLANE ASSEMBLY

● Teach your students actual industry methods with glues that are meeting Uncle Sam's toughest requirements for wood aircraft assembly.

Let us send you complete information on glues to meet latest Army, Navy and prime contractors' specifications.

FREE TEACHING AIDS

CASEIN COMPANY OF AMERICA, INC., Dept. SS-1242
350 Madison Avenue, New York, N. Y.

Please send me Chart and Technical Bulletin on Wood Glues for Aircraft Manufacture.

Name.....

School.....

City.....

(Please attach school letterhead)

CASCAMITE Powdered Resin Glue. Mixes instantly in cold water. No waiting. Makes waterproof, stainfree joints.

CASCO Powdered Casein Glue. Cold water mix. Makes strong bonds with moderate pressure, even on beginners' imperfect work. Water-resistant.

Coupon for free project plans in every 25 cent or larger can.

McGRAW-HILL AVIATION TEXTS

for

SHOP COURSES

•

Shields'

The Introductory Aviation Series

Principles of Flight.....$1.88

Principles of Aircraft Engines $1.88

•

Norcross and Quinn's

The Aviation Mechanic..$3.00

How To Do Aircraft Sheetmetal Work.....$2.20

•

Norcross's

Aircraft Blueprints and How To Read Them.....$1.75

•

Nisita's

Aircraft Riveting.....$2.50

•

Elzea's

Aircraft Welding.....$2.00

•

Naidich's

Mathematics For The Aviation Trades.....$1.80

•

Send for copies on approval.

McGRAW-HILL BOOK CO. INC.

330 West 42nd Street, New York

instructional resources

Inquiries concerning materials described in these columns may be addressed to SCHOOL SHOP, Box 100, Ann Arbor, Mich., and will be passed on to the proper firm or person.

Reading Aircraft Blueprints. Goff and Novak. Bloomington: McKnight & McKnight, 1942. $1.50, complete.

Following introductional material on blueprints in general, dimensioning, and aircraft terms and abbreviations, the text is divided into five parts. Part I deals with the plane as a whole; the other four with sheetmetal; standard parts; forgings, castings, and machined parts; and assemblies. The *Instructions and Questions* book contains informational material, procedure instructions, and questions. The blueprint book contains blueprints for each section of the instruction book. Appendix of tables.

Francis L. Goff and Lloyd R. Novak are aeronautical engineers for McDonnell Aircraft Corp., St. Louis, Mo.

Procedure Handbook of Arc Welding Design and Practice. Cleveland: Lincoln Electric Co., 1942. Pp. xi + 1267. $1.50.

In eight parts covering in detail the entire field of arc welding: welding methods and equipment; technic of welding; procedures, speeds, and costs; fleet-fillet technic; weld metal and tests; weldability of metals; welded steel construction—machine design; designing of arc-welded structures; and typical applications. Amply illustrated with photos and drawings; tables; reference data; index.

This is the seventh edition of this popular welding text published by the Lincoln Electric Co., makers of arc welding equipment.

Theory of Flight and Aircraft Engines. Shields. New York: McGraw-Hill Book Co., 1942. Pp. x + 377. $2.75. (second edition).

Part I deals with aircraft and theory of flight—development of the airplane, nomenclature, elementary physics and forces in flight, controls, instruments, maintenance, parachutes. Part II covers engines—a chapter each on engine performance, fuel systems, electric systems, propellers, etc. Illustrations; appendix; review questions; index.

Bert A. Shields is chief instructor in charge of civilian pilot training, Polytechnic Institute of Brooklyn.

Drill Press Job Training Units. Chicago: American Technical Society, 1942. Pp. 103. $1.25.

Another in the Dunwoody Institute series of machine-shop training jobs. A series of drill-press jobs, increasing in complexity and skill required of the student. Each job lists materials and tools needed, general instructions, operating steps, sketches applying to the job, precautions, questions, and references. Illustrated; appendixes; separate book of answers.

Before You Fly. Robinson et al. New York: Henry Holt & Company, 1942. Pp. xiv + 332. $1.08.

This book provides much excellent material on the background of aviation of interest to the teacher and student of preflight aeronautics and shop aviation work. The introductory chapters deal with flying as a career, both today and in the future. Unit I discusses the history of flight; II, aerodynamics; III, aircraft construction; IV, aircraft engines. Glossary of aeronautical terms; readings; index. Well illustrated with photos and drawings. Teachers manual furnished.

Authors of the book are Pearle T. Robinson, Frederic A. Middleton, and George M. Rawlins, Jr., all of the Washington, D.C., schools, and Major Joseph W. Phillips, U. S. Army Air Force.

The Man Behind the Flight. Jordanoff. New York: Harper & Brothers, 1942. Pp. vi + 276. $3.50.

This book is intended for the student planning to enter "ground crew" or maintenance work—for the 10 men on the ground needed to keep one plane in the air. The contents deal with elementary presentations of flight principles, drafting, electricity, hydraulics, mechanics, physics. A chapter also on the history of flight. Illustrated with easily-understood drawings; a portfolio at the end of early and modern planes and famous pilots.

Assen Jordanoff is a member of the I. Ae. S. and the S. A. E. He has flown for 30 years, is the author of *Flying and How To Do It, Your Wings, Through the Overcast,* and *Safety in Flight.*

A B C of Aviation. Pagé. New York: Norman W. Henley Publishing Co., 1942. Pp. xi + 598. $2.50. (second edition).

Chapters on the aircraft industry, both lighter and heavier-than-air craft, construction and design, engines, propellers, control methods, instruments, inspection, maintenance. Each chapter illustrated; quiz questions at end of each chapter. Index.

Victor W. Pagé is a lieutenant colonel in the Air Corps Reserve, author of *Airplane Servicing Manual* and *Aviation Engines,* and a member of the Advisory Board for Aeronautics, State of Connecticut.

Aircraft Sheet Metal Worker's Manual. Look. Chicago: Goodheart-Willcox Co., 1942. Pp. ix + 122. $2.50.

A condensed guide and reference for requirements, specifications, formulas, standards, symbols, alloys, tools, and tool usage, as required for developing accuracy and skill in aircraft sheetmetal work. Contains introductory information on curriculum operations, shop rules and practices, and tips from experience. Section dealing with shop notes, fastenings, tools, safety rules, and projects. Index; illustrations.

Robert C. Look teaches mechanics at Escondido, Calif., Union High School.

Here's the RADIO MANUAL YOU MUST HAVE!

THE IDEAL RADIO MANUAL FOR INSTRUCTORS

THE new Meissner "How to Build" Radio Instruction Manual, edited by expert Radio Engineers is fully illustrated with charts, Radio Formulae, Schematic Circuit Diagrams and Pictorial Wiring Diagrams. Contains a complete outline of Frequency Modulation Theory.

Construction data on 22 kits for building radio receivers and adapter units, with operating instructions and servicing data on over a dozen complete assemblies, including FM Receivers, Phonograph-Recorder, and radio equipment, also gives you valuable coil design and circuit application data.

the NEW
Meissner
"How to Build"
INSTRUCTION MANUAL
FULLY ILLUSTRATED WITH CHARTS, RADIO FORMULAE, SCHEMATIC CIRCUIT DIAGRAMS AND PICTORIAL WIRING DIAGRAMS
Price Fifty Cents

The Radio Instruction Manual for the beginner and the advanced student training.

Price, only 50 cents post paid anywhere in the U.S.A. (seventy-five cents in Canada). Send for your copy today!

Meissner
MT. CARMEL, ILLINOIS
"PRECISION-BUILT PRODUCTS"

BOOKS *of Direct Interest and Value to WAR TRAINING*

PLASTICS
Problems and Processes

$3.00 *(Second Edition)*

by Dale E. Mansperger and Carson W. Pepper. This is an important book in an important field. It contains complete information on recent plastics processes and is especially useful to Industrial Arts pupils by reason of its 65 problem plates, over 200 designs and 166 figures, all of which aid in introducing students to the widening field of plastics without too much technical stress upon any particular phase. This new second edition is a completely new book.

AIRPLANE DRAFTING

$3.50

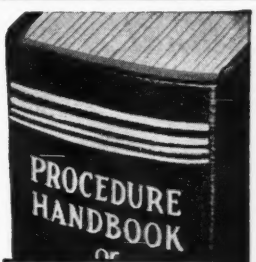
by Daniel J. Brimm, Jr. This book is intended for those desiring information on practices used in airplane drafting rooms, material used in constructing airplanes, elementary aeronautical engineering and descriptions of cockpits and seaplane floats. Students engaged in airplane work or anticipating such a vocation will find this fully illustrated book extremely useful.

HANDBOOKS

The MACHINE SHOP and BUILDING TRADES HANDBOOKS are tiny encyclopedias of useful information. They present rules, tables, formulas, and other topics frequently used in an authoritative and reliable manner..... **Each $1.00**

International Textbook Company *Scranton, Pennsylvania*

NEW BOOK on ARC WELDING



New Edition "Procedure Handbook of Arc Welding." Bigger than ever. Wider in scope. Latest information on all phases of arc welding—the ace process of war production and key to progress and increased earning power in post-war era.

Authoritative. Recognized the world over as the "bible" on arc welding design and practice. Many thousands in use by welders, designers, engineers and shop managers. Standard text in hundreds of schools and colleges.

A $5.00 Value for only **$1.50** post-paid
($2.00 outside U. S.)

Order your copy today

IN 9 CHAPTERS:
1308 pages
1810 illustrations

I. Welding Methods & Equipment
II. Technique of Welding
III. Procedures, Speeds & Costs
IV. Weld Metal & Methods of Testing
V. Weldability of Metals
VI. Machine Design
VII. Structural Design
VIII. Applications
IX. Reference data

Size 6" x 9" x 1¾"

Mail order and check to

The Gilson Company
75 E. Wacker Dr., Chicago, Ill.

Practical Textbooks
Examine Them on APPROVAL

These modern texts have been especially prepared for school use. You can employ them to excellent advantage in your Victory Training program as well as your regular program. An examination will convince you of their suitability to your classroom needs. Any books sent for 30 days ON APPROVAL inspection subject to our educational discount if retained.

Dunwoody Arc Welding Unit	$1.25
Dunwoody Gas Welding Unit	1.25
Dunwoody Lathe Job Training Unit	1.35
Dunwoody Bench Work Job Training Unit	1.35
Dunwoody Grinder Job Training Unit	1.25
Dunwoody Drill Press Job Training Unit	1.25
Dunwoody Shaper and Planer Job Training Unit	1.25
Dunwoody Milling Machine Job Training Unit	1.25
Shipbuilding Blueprint Reading	3.00
Tool Design	4.50
Machine Trades Blueprint Reading	2.00
Plastics	3.00
How To Read Electrical Blueprints	3.00
*Flight—First Principles	2.50
*Flight—Aviation Engines	3.25
*Flight—Meteorology and Aircraft Instruments	3.25
*Flight—Construction and Repair	2.50
Machine Shop Work	3.50

*Note: These books have been listed in Leaflet No. 63 issued by U. S. Office of Education.

(TEAR OFF HERE AND MAIL TO US)

AMERICAN TECHNICAL SOCIETY
Drexel Ave., at 58th St., Chicago, Dept. HS—140

Please send the following texts for 30 days ON APPROVAL examination. I will either return them at the end of that time or remit less your educational discount.

Name _____

School _____

School Address _____

What Do You Think?

What activities and course-of-study changes have you found valuable in meeting the request of the War Department and U. S. Office of Education to increase aviation activities?

Says Hugh P. Harshbarger, director of practical arts, Maine Township High School, Des Plaines, Ill.:

We think our first duty is and has been to keep boys and girls industrially minded by working with practical problems and materials. For the past ten years, consequently, 75 percent of our 1800 student body have been enrolled electively somewhere in the Industrial-Practical Arts Department.

Recently a new course in pre-flight aeronautics has been opened to junior and senior boys and girls with much response. We are finding our new evening class in radio and aircraft detection unusually interesting. Plans have been completed and work started on an airplane detector or finder which will be installed in the tower of the high school. Students in electricity, physics, and mathematics will cooperate.

Our industrial department has recently been given numerous aircraft fuselages, a variety of wing and tail sections, several Wright motor blocks, and parts by a local airport. Displays have been arranged in each department. We think it lends atmosphere and educational background toward developing "an airmindedness" in our student body.

Says L. P. Elliott, supervisor of industrial education, Peoria, Ill., schools:

We have produced some 600 model airplanes which were an eye opener to some of our high-school industrial arts classes. The accuracy required for these models has been well worthwhile to many boys who have simply attempted to build airplane models without definite dimensions.

Most of our efforts toward war work have been devoted to the defense-training program for adults, and we have as yet done very little towards aviation. We are in a locality where there is no aviation going on and this perhaps explains in a measure, the reason for this lack of activity.

We have had to get together and have organized high-school classes in so-called "Aviation Mathematics and Science" and have studied the question of work in the shops. The cry on the part of the army officers for this type of specialized training has been made by individuals who know nothing of the physiology or the abilities of adolescent youth. The training that is asked for is of a specialized type that is set up for a few of our advanced students who are interested in that sort of work but probably cannot be applied with much success to the large portion of our younger students.

Of course there are many things connected with aviation which we can bring into the picture with all of our shop students and probably can help create a vital interest in aviation, but there still remains a question of whether the youngsters are old enough for the specialized training which the army officers are suggesting.

Says Elmer W. Christy, director of industrial arts, Cincinnati, Ohio, schools:

Our programs do not change fast enough to permit me to directly answer the question in your recent letter regarding increased aviation activities in our school shops. We accepted a quota of solid model airplanes for the Navy last year but we handled it strictly on an individual pupil basis. This year we shall complete that quota and accept another one but we shall follow the example of some other cities and do some of the work on a quantity production basis.

For 15 years or more our aviation program has been centered in our Aviation High School as part of our Smith-Hughes program. This year, our science and mathematics teachers, in common with most of the high schools of the country, have launched their program of aeronautics and meteorology but they seem to have found a need for the kind of approach which can be made through industrial arts.

High-school teachers of science, mathematics, social studies, and industrial arts are all striving to teach pre-flight aeronautics as part of their war effort. Each one of these areas can probably present some one or more phases of the air-age study better than the other areas because of its special facilities. The way to solve this very important problem is to have each area contribute that which it can do best and thus develop the best possible course of study. We have in this project a fine opportunity to develop a really integrated program.

Says Archie P. Nevins, supervisor of industrial education, Kalamazoo, Mich., schools:

The model-airplane project has been the outstanding means of increasing aviation activities in school shops all over the country, and has aroused interest on the part of many pupils. The inclusion of many of the projects outlined in the book *Aeronautics in the Industrial Arts Program* by Wilbur and Neuthardt is a real stimulator of interest in things aeronautical and excellent industrial arts material for junior high school.

We have introduced courses in industrial science dealing particularly with mechanics and electricity, in shop mathematics, and elementary aeronautics, all integrated into the industrial education program of the high school. The aeronautics program is a wartime innovation; the others were introduced as a part of our industrial education sequences qualifying for high-school graduation and an industrial certificate.

Work in the sheetmetal shop has been centered more around riveting and work similar to, or preparatory to, airplane metal work. Auto-shop students work on airplane motors as well as automobile motors; the welding shop pays particular attention to the welding of aluminum sheet (when we can get it) and to torch welding of steel tubing and thin steel sheet. The drafting rooms and mathematics classes are choosing problems from the field of aviation, and the pattern making classes have turned airplane model builders.

Strictly Personal...
ABOUT YOUR FELLOW TEACHERS

AFTER serving six years as state supervisor of trade and industrial education for Missouri, E. F. DANIELS is now training specialist at the Wellston Air Depot, Robbins Field, Macon, Ga. . . . FREDERICK J. TRINDER, director of apprenticeship training, Biddeford, Me., passed away last spring. . . . Principal of the Pennsylvania State School of Aeronautics is ROBERT T. STONER, formerly director of vocational education at Hershey, Pa. . . . Returning to his post as Head of Industrial Education and Director of the Baltimore Division, University of Maryland College of Education is GLEN D. BROWN. He has been on leave since June, 1941, as State Youth Administrator, NYA, for Maryland and District of Columbia, and more recently Assistant Regional Administrator, NYA region IV. Prof. Brown will also serve on a part-time basis as acting supervisor of trade and industrial education with the Maryland State Department of Education. . . . Now an officer at Fort Leonard Wood is L. L. YEAKEY, former director of vocational education at Bay City, Mich. . . . WADE WILSON, head of the industrial education department of A. & I. State College, Nashville, Tenn., is now an instructor of aircraft mechanics at Chanute Field, Ill. . . . DAVID M. WHERRY, formerly of Dayton, Ky., High School, is now on the faculty of Cummins School, Cincinnati, Ohio. . . . JOSEPH CITRON, PAUL CULVER, and C. J. JACOBSON, all of Woodruff High School, Peoria, Ill., have become members of the Army. . . . The retirement has been announced of LINDER S. WOOD, head of the industrial arts department at Bloomington, Ill., where he taught for 35 years. . . . OLIVER C. BUMB, South Bend, Indiana, has been appointed assistant professor of industrial arts in the Arts Workshop of Ball State Teachers College, Muncie, Ind. . . . New chairman of the industrial arts department of Southwest Texas State Teachers College, San Marcos, is VICTOR L. BOWERS. . . . ROY N. WALTERS, Berea College, Berea, Ky., has been appointed to Acting Dean of the Berea College Foundation. . . . Successor to the late CARL A. BELL as State Director of Vocational Education in Illinois is J. E. HILL, former State Supervisor of Agricultural Education.

news

WHAT'S DOING IN THE FIELD OF INDUSTRIAL EDUCATION

YOUR WINGS is the title of a booklet recently published by United Air Lines as an aid to the understanding of air transportation. Chapters deal with history of air transportation and of United Air Lines—describing the work of the company's personnel in research, medical work, maintenance, etc. Information is presented on the features and advantages of air travel; the future prospects of air travel are also discussed.

VOCATIONAL training for war workers will occupy the principal attention of a newly-organized Committee on Education of the U. S. Chamber of Commerce. The committee has been cooperating with the American Association of School Administrators in bringing about closer coordination of business, labor, and educational groups working on this phase of vocational training.

Thomas C. Boushall, president of the Morris Plan Bank of Virginia, Richmond, is chairman of the committee.

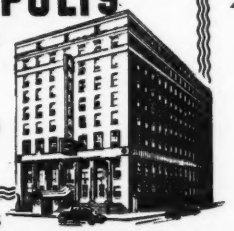
THE Apprentice-Training Service of the Federal Security Agency has reorganized its field offices into 12 regions, William F. Patterson, Chief of the Service, has announced. This move is intended to make for smoother working relations with other labor-supply and training agencies and to permit more specific utilization of existing apprenticeship facilities and personnel. Headquarters of the 12 regions are to be set up in Boston, New York, Philadelphia, Cleveland, Chicago, Minneapolis, Kansas City, Denver, San Francisco, and other cities. Regional supervisors are to be announced.

A CHART of job opportunities in the U. S. Army Air Forces has been prepared by the U. S. Office of Education and the Air Corps. This chart shows in tabular, easy-to-read form, all of the types of work for which Air Corps men are sought and the attendant training needed, wages provided, and other requirements and information.

A BROCHURE describing the program of the Chicago Bureau of Industrial Arts Education has been published by the Chicago Board of Education. Text and pictures describe the industrial arts laboratory, the laboratory of arts and industries, the home mechanics laboratory, and the program of integrated handwork.

A BOOKLET presenting the graphic arts as an occupation has been prepared by the Cincinnati Printing High School, of which R. Randolph Karch is principal. The booklet points out the wide variety of jobs within the graphic arts industry and the greatly varying talents and interests that are needed to fill these jobs. Such widely different abilities as those of commercial design and mechanical aptitude are related, for example, to the jobs of layout artist and linotype operator. Information is also included on the salary possibilities of each type of work.

APPROXIMATELY 1500 Negro students are accommodated in temporary shop buildings erected adjacent to Chicago's Dunbar Vocational School this summer. The shops provide training in aviation, automechanics, foundry, welding, machine shop, sheetmetal work, woodwork, plastering, lathing, printing, radio, and other trades.

HOTEL
ANTLERS
INDIANAPOLIS
SCOTT HATTUCK Mgr.
MERIDIAN AT ST. CLAIR
OPPOSITE WORLD WAR MEMORIAL PARK
200 ROOMS $2.50 WITH BATH FROM

ONE OF THE ALBERT PICK HOTELS

ELEMENTS OF AERONAUTICS
By Pope and Otis
Proved successful in the rigorous test of wide classroom use. Scientifically and painstakingly prepared. Recommended by educators and aeronautical authorities—civilian and military. Gives the essential aviation background for students preparing for aircraft industries, ground work, or flight training.
Now in its 10th large printing
WORLD BOOK COMPANY
Yonkers-on-Hudson, N. Y. 2126 Prairie Avenue, Chicago

HOTEL FOUNTAIN SQUARE
If you consider location important, stop at Hotel Fountain Square—close to all business, shopping and social centers, providing unrivaled convenience in Cincinnati. Large, pleasant rooms—superior service. For fine food visit the air conditioned Moorish Grill—and the Olympic Cafe and Bar for sparkling gaiety.
250 MODERN OUTSIDE ROOMS WITH BATH
from $2.50
CINCINNATI, OHIO

THEY *all* FIT
THEY'RE *all* INTERCHANGEABLE
—*INSTANTLY...and renewable*
New! 16-page illustrated book "How to Build Scale Models for Defense." Expert information for your Shop Project Work.

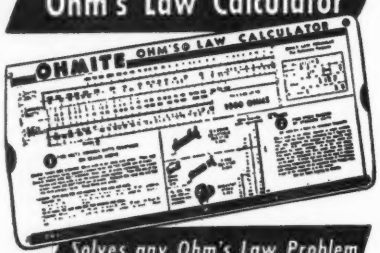
SUPER KEEN—IDEAL FOR MANUAL TRAINING
Help the Navy! 500,000 scale model planes needed fast. X-Acto builds them better, quicker, easier. WRITE US NOW! X-Acto Crescent Products Co., Inc., 440 Fourth Ave., New York, N. Y.
X-acto REFILL BLADE KNIVES

Air School

(Continued from page 7)

made in assignments or supervision. Each practical instructor has a trainee load of 10 to 15 at a time, while the average class roll in related instruction is 28. The School has operated on a six-day week, two eight-hour shifts per day, and the average teacher load is 40 hours per week. Aside from the instructor's teaching load, he must constantly revise his course of study and course content material to adapt it to the aircraft maintenance procedure as established by the Army Air Corps, and give remedial instruction to below average trainees in his extremely heterogeneous group.

Everyone Can Use this Handy OHMITE Ohm's Law Calculator



Solves any Ohm's Law Problem with one setting of the slide...

EXTREMELY helpful in the training program today. Helps your students figure ohms, watts, volts, amperes—quickly, easily. No slide rule knowledge necessary. All values are direct reading. Two sides cover the range commonly used in electrical and radio work. Size 4⅛" x 9". Yours for only..... **10c**

TEACHERS

Write for information on how you can obtain a quantity of these calculators for your students at a special price.

OHMITE MFG. CO. 4835 Flournoy St., Chicago

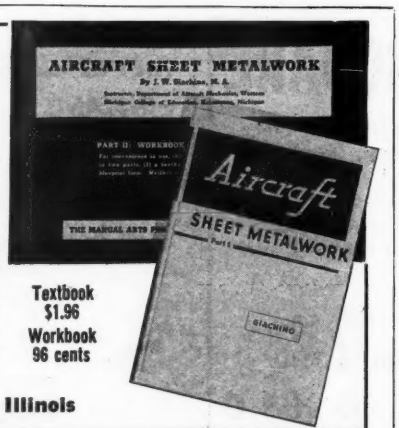
Be Right with OHMITE
RHEOSTATS · RESISTORS · TAP SWITCHES

The New Standard Text
Unequaled for Instruction Value and Effective Illustrations

Aircraft Sheet Metalwork

J. W. Giachino

Used by Army, Navy, and factory schools, as well as by public and private schools to train aircraft workers. Part I is a complete text explaining, discussing, and picturing tools, materials, and methods. Part II is a workbook with blueprints of 27 choice projects.



Textbook $1.96
Workbook 96 cents

THE MANUAL ARTS PRESS, Peoria, Illinois

IN THE *Morning Mail...*

Brief comments about SCHOOL SHOP *and the field it serves are invited. Address the Editor,* SCHOOL SHOP, *Ann Arbor, Michigan.*

Gentlemen:

I certainly am glad to receive SCHOOL SHOP each month. I would like to have this information: We are putting in a short course of airplane drafting for first-year high-school students and would like to know if you could recommend a text or good book that could be used. This would be an extra course along with the mechanical drawing work. Some of the boys are interested in aircraft drawing and I thought it would be nice if we could work something in this line into the course. Please let me know if you have any suggestions.

FRED W. ANDERSON,
Drummer Township High School,
Gibson City, Ill.

● Because of the similarity of aircraft drafting to other mechanical drawing, few books have been published exclusively on this subject. Below is a list of some of these books together with others which have sections on drawing or blueprint reading for aircraft work.—*Ed.*

Airplane Drawing, Giachino and Sonsmith. Goodheart-Willcox Co., Chicago.

Fundamentals of Aircraft Drafting, Brydon. Delgado Trades School, New Orleans.

How to Read Aircraft Blueprints, Owens and Slingluff. John C. Winston Co., Philadelphia.

How to Draw Planes, Wootton. The Studio, New York, N.Y.

Airplane Metal Work: Vol. I, Airplane Blueprint Reading, Robson. D. Van Nostrand Co., New York.

Airplane Lofting, Nelson. McGraw-Hill Book Co., New York.

Aircraft Layout and Detail Design. Anderson. McGraw-Hill Book Co., New York, N.Y.

Airplane Drafting. Brimm. International Textbook Co., Scranton, Pa.

Gentlemen:

We have enjoyed SCHOOL SHOP this year and look forward to receiving it each month. It is filling a much-felt need and we appreciate your sending it.

I have been conducting a rather interesting project here this summer in the machine shop of the Midland High School. I am enclosing a clipping (see cut) which appeared in our local paper giving some of the details of the setup. The summer program has been so successful that we are continuing it on a part-time basis through the school year.

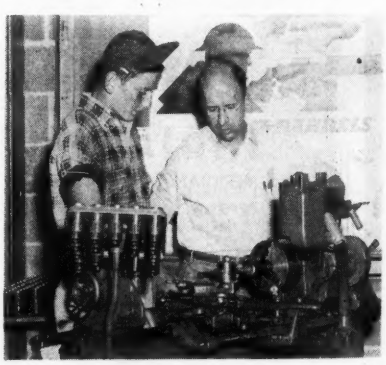
The boys have enjoyed the work and have received valuable experience as well as pay. They are all anxious to continue through the winter term. None of these boys is over 17 years old.

Financially, too, the project has been very satisfying. After paying all expenses on the summer program, we will clear enough money to purchase two or three machine tools which we need to complete our shop equipment.

The teacher, too, has learned. I have learned that love for their country is first in the hearts of these boys. Even the generation that has been raised to abhor the thoughts of war are true Americans and when the need arises, are "all-out" for Victory.

RALPH L. VANDERSLICE, Machine Shop Instructor,
Midland, Mich., High School.

● Under reader Vanderslice's supervision, the Midland school has carried on a program of parts production for local



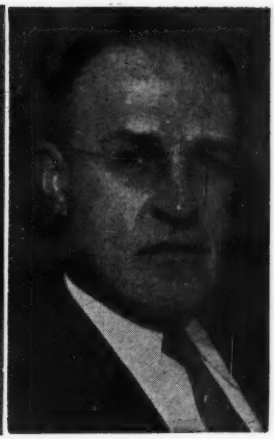
war industries. The above picture illustrated a front-page article in the *Midland News* taking cognizance of the part the school was playing in the war program.—*Ed.*

Front Cover . . . .

The young man on the cover is an enthusiastic model builder for the Navy from Powell Junior High School, Washington, D. C.

The photographs on pages 8 and 10 are courtesy of the *Detroit News,* Detroit, Michigan.

The drawings on page 8 are by Al Wolgat and R. Bergman of the Sign Shop, Munger Junior Trade School, Detroit, Michigan.



AVA HOLDS WarWork CONFERENCE AT TOLEDO

© Washington, D.C., Press Photo Bureau

Left: AVA President John J. Seidel, Maryland Director of Vocational Education. Right: Executive Secretary L. H. Dennis, Washington, D. C.

TO ASSIST vocational schools in their contribution to the war, the annual meeting of the American Vocational Association at Toledo, Ohio, December 2 to 5, will be a "War Work Conference."

Wednesday . . .

Opening session will be in the Toledo Museum of Art in the evening. U.S. Commissioner of Education John W. Studebaker will be chairman. Speakers will be Brig.-Gen. F. J. McSherry, Director of Manpower Operations, War Manpower Commission, who will discuss War Production Training, and Merwin M. Peake, Chief, Pre-Induction Training Section, U. S. War Department, who will discuss Pre-Induction Training.

Thursday . . .

Morning sessions will include Training for the Aviation Industry, Training Within Industry, Finance and Accounting Procedures, Labor and Industrial Relations, Training of Women for Industry, Occupational Information and Guidance, and Industrial Arts Education.

Theme of the last-mentioned session will be Success Factors in the Growth and Achievement of the Teacher of Industrial Arts. The Training of Women for Industry session will carry over into a luncheon meeting at Whitney Vocational School.

In the afternoon, industrial arts men will discuss Problems and Procedures of Industrial Arts in the Small School. Other sessions include Instructional Aids and Publications, Training for Safety, Diversified Cooperative Training, Developments in Radio and Communications, and Training Courses for Civilian Personnel for the Military Forces.

Special arrangements are under way for a different type of meeting and entertainment to take the place of the Convention Banquet. Details are to be announced.

Friday . . .

A breakfast meeting under the chairmanship of Jamison Handy, president of Jam Handy Organization, will discuss Vocational Visual Aids. Further Visual Aids meetings will be held in the morning and at a luncheon. Other morning sessions are on Vocational Rehabilitation, Significant Trends and Relationships of Industrial Arts, and the AVA General Session, at which E. L. Bowsher, superintendent of Toledo schools, will conduct a symposium and Grove Patterson of the *Toledo Blade* will speak. A visit to Macomber and Whitney Vocational Schools follows.

Afternoon sessions are on Training of Women for Industry, The Long-Term Industrial Education Program, The Apprentice Program, Fabricating Tools and Equipment, Industrial Arts in the Post-War Era, and Planning Effective use of our Potential Manpower.

Saturday . . .

Morning meetings will discuss the topics of Vocational Education for the Post-War Period, Industrial Mental Health, Manning Machines on the War Production Front, Vocational Education in Civilian Defense, Welders for War Production Jobs, and Training for the Printing Industry. The Industrial Arts Luncheon, at noon, will be concerned with the theme, The Problem of Maintaining Standards in the Face of a Teacher Shortage.

WILEY BOOKS for *Aviation Training*

AIRCRAFT ENGINE MAINTENANCE

Lieut. James H. Suddeth

374 pp. illus. 6 by 9. $2.75

Careful instruction on the operating and construction principles of the aircraft engine and accessories, as well as detailed study of maintenance procedure. Practical workable information.

AIRPLANE MAINTENANCE

Hubert G. Lesley

511 pp. 384 illus. 6 by 9. $2.75

An authoritative volume, presenting all the material necessary to the airplane mechanic. Materials, construction of airplanes, servicing, testing, are covered clearly and simply.

THE AIRPLANE AND ITS COMPONENTS

William R. Sears

75 pp. illus. $1.25

Internal and external components are considered: electrical and radio installations, the hydraulics system, armament, armor and similar subjects. Almost no mathematics is involved.

ESSENTIAL MATHEMATICS FOR SKILLED WORKERS

Harry M. Keal and Clarence J. Leonard

317 pp. 218 illus. 4⅞ by 7.

Trade Edition $2.00

Covers review arithmetic, geometry, algebra, trigonometry and applied technical problems. *Ideally suited for Aviation Training Courses.*

ELEMENTS OF SUPERVISION

William R. Spriegel and Edward Schulz

268 pp. 6 by 9. $2.25

Practical, immediate help for foremen and supervisors. Contains outlines for types of programs, suggestions for the supervisor-to-be, qualities and types of organizations.

STRENGTH OF MATERIALS

Mansfield Merriman. Eighth Edition Revised by E. K. Hankin

148 pp. 71 illus. 5½ x 8½. $1.50

An old standby in modern dress. The material has been condensed and brought up to date, and now includes information on materials such as plastics and aluminum.

Send for on approval copies

JOHN WILEY & SONS, Inc.

440 FOURTH AVE., NEW YORK

PRE-FLIGHT 16 MM
TRAINING FILMS

SILENT

AIRPLANE WELDING (2R)
AIRPLANE RIVETING (2R)
MAKING OF AN AIRPLANE FITTING (2R)
AIRPLANE SHEET METAL WORK (2R)
Rental: $3.00 per subject
Sale: $48.00 per subject

SOUND

AIR CURRENTS & THEORY OF STREAMLINING (1 R. Sd.)
Rental $1.50 Sale: $27.00

PRINCIPLES OF FLYING (1 R. Sd.)
Rental $1.50 Sale: $36.00

THE AUTOGIRO (1 Reel Sd.)
Rental $1.50 Sale: $27.00

SPOTTING THE BOMBERS (1 R. Sd.)
Rental $1.50 Sale: $27.00

CAVALCADE OF AVIATION
From the Wright Brothers to today's fighting over Europe.
2 Reels Sd. Rental: $3.00

HISTORY OF AVIATION (3 R. Sd.)
Comprehensive—from the first flight in 1903 to modern commercial flying.
Rental $4.50 Sale: $100.00

AIR ARMY (1 Reel Sd.)
America's sky armada from production line to performance in the air.
Rental $1.50 Sale: $27.00

Five Minute 16 MM. Sound Shorts
PROPHET WITHOUT HONOR
(Billy Mitchell)
SEA POWER VS. AIR POWER
NIGHT HAWKS
OUR EMPIRE IS THE AIR
Rental: $1.00 ea. Sale: $15.00 ea.
Send for Complete Information

WALTER O. GUTLOHN, Inc.
25 W. 45th St. Dept. L-12 New York

Changing Positions?
Your fellow teachers are interested in what you are doing . . . let SCHOOL SHOP know, so your name can be included in the *Strictly Personal* column . . . give new school address and subjects taught.
SCHOOL SHOP *personalities*
Box 100 Ann Arbor, Michigan

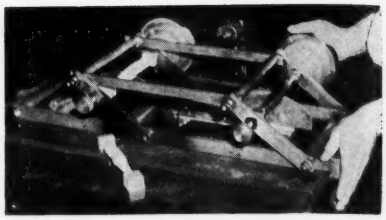
Instructors . . .
Write today for Catalog No. 43. Model Airplanes, Plans, Cement, Fillet, Archery Material, Plastics, Leathercraft, and hundreds of other Craft Items.
Western Crafts & Hobby Supplies
532 W. Second St., Davenport, Iowa

Preflight Airplane Kits
500 approved models, 25c up
Gas motors & Supplies. Special Wholesale School Discounts Save 25%.
Send 15c for catalogs.
BENNETT HOBBY SHOP, 8101 Ingleside, Chicago, Ill.

"TARGET FOR TONIGHT"
FILMS of the RAF in action over Germany. Great inspiration to Aviation Students and all civilians. Also available at nominal charge:
U. S. WAR SHORTS
Write for free catalog: "TARGET"
BRANDON FILMS, Inc.

Model Airplane Fuselage Duplicator

BY *Robert L. Stephens*



This device is not only useful because of the speed with which it is possible to make fuselages, but also because it demonstrates the operation of a type of device frequently used in industry for similar purposes. Robert L. Stephens teaches industrial arts in the Vincennes, Indiana, High School.

MANY devices have been made and used for the purpose of large-scale production of small-scale airplane models. One such device has been developed and is in daily use in the Vincennes, Indiana, High School.

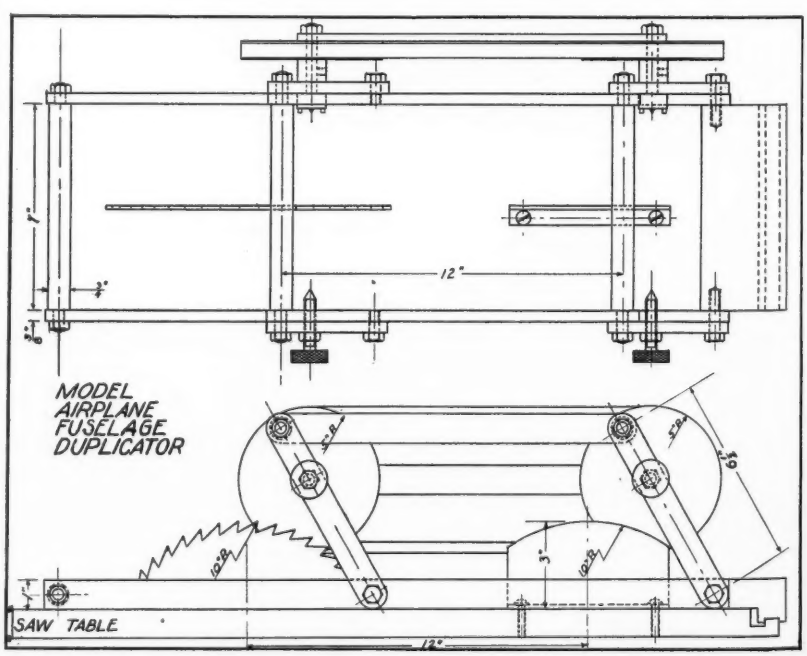
The idea was conceived when an order was received to produce 150 models of one kind for the Navy. Since the fuselage is the most difficult part to make, I decided to simplify the process and step up the output.

Instead of using the jack-knife method of cutting the wood and trying the templates at certain points along the fuselage until the correct dimensions and curvatures are obtained and then blending in the contour from point to point, we rough it out to approximate size on the saw attachment and finish it with a few strokes of a wood rasp and sandpaper. One boy operates the duplicator and another finishes the stock as it comes off the saw. Two boys working together produce four units per hour.

To operate the device the student first places a piece of wood stock between the centers that are located over the circular saw. Then, with the master fuselage resting on the arc-shaped indicator, he raises the saw until it cuts the proper depth. This test for depth is made by cutting out the cowling section and checking the diameter with calipers to ascertain when the job conforms in size to the master pattern.

Once the machine is set up, the operator holds the device in position with his left hand and revolves the centers with his right by turning the pulley. The whole assembly is moved laterally the width of the saw kerf after each revolution of the patterns. This produces a fuselage which has the correct contour around the body at intervals of about one eighth of an inch. After this is done, it is an easy matter to complete the job.

The master pattern is made of steel and is 6½" long. The jig will accommodate any pattern up to 7". Fuselages of greater length can be cut out on this attachment by inserting spacers between the pantographs which correspond to the lengths of the fuselages to be processed.



the 27 *fastest Selling*
Aviation Books in America

1. Aircraft Sheet Metal Work
By H. E. Boggess, Jr., Lt. Comm., U.S.N.R. Cloth. 128 Pages. Illustrated. Published 1941.
Describes actual factory and field operations of Metal Mechanics. Technically correct, concisely and simply presented for beginners, mechanics, draftsmen, manufacturers.
Only $1.00

2. Preliminary Airplane Design
By Capt. R. C. Wilson, Wright Field. Cloth. 80 Pages. Published 1941.
From material prepared as guide in the Air Corps Office at Wright Field—approved by the United States Air Corps Engineering School. Simplified . . . sound . . . provides real working knowledge or Airplane Design.
Only $1.00

3. Aircraft Blueprint Reading
By H. V. Almen, Douglas Aircraft Co., and R. K. Mead, Lockheed Aircraft Corp. Cloth. 127 Pages. Published 1940.
First thorough, yet practical, book on this subject . . . real help to any mechanic who wishes to comprehend every item of information on his blueprints."—Says Bradley Jones—U. S. Air Service.
Only $1.00

4. Practical Mathematics of Aviation
By A. E. Downer, Cass Technical High School. Cloth. 124 Pages. Illustrated. Published 1939.
A clear, concise treatise on Aviation Mathematics . . . providing a real working knowledge of the basic fundamentals behind all Aviation problems.
Only $1.00

5. Aircraft Inspection Methods
By N. C. Bartholomew, Curtiss-Wright Corp. Cloth. 138 Pages. Illustrated. Published 1940.
How to know when plane is really airworthy. Understand the problems of mechanics and engineers—how to decide when specified conditions have been met. For the Beginner—the Student—the Mechanic.
Only $1.25

6. Elementary Aerodynamics
By Group Captain D. C. M. Hume, R.A.F., Canada. Cloth, 144 Pages. 54 Illustrations. Published 1941.
Basic Facts behind Science of Mechanical Flight presented simply, accurately. Provides thorough understanding of the complete "Theory of Flight." Especially for students and the layman.
Only $1.50

7. The Aircraft Propeller
By R. Markey, Vought-Sikorsky Aircraft. Cloth, 166 Pages. Illustrated. Published 1940.
Complex scientific side of propeller problems presented for easy understanding by students, mechanics, engineers. Covers principles, maintenance and servicing of aircraft propeller.
Only $1.50

8. Aircraft Maintenance
By D. J. Brimm, U.S.N.R. and H. E. Boggess, U.S.N.R. Cloth. 512 Pages. 700 Illustrations. Published 1940.
Sound, accurate enough for the most exacting engineer . . . clear enough for the beginner . . . detailed . . . for practical work in the shop.
Only $2.50

9. Aircraft Engine Maintenance
By D. J. Brimm, U.S.N.R., and H. E. Boggess, U.S.N.R. Cloth. 479 Pages. 500 Illustrations. Published 1939.
Complete, comprehensive guide to aircraft engine maintenance. Sound—accurate enough for the most exacting engineer . . . yet clear and easily understood by the beginner. Now used in thousands of Aircraft Plants throughout the country.
Only $2.50

10. Experimental Aerodynamics
By Henry Christensen Pavian. 171 pgs., 80 ill.
"Professor Pavian has written a book in simple language in which he describes the fundamentals of his subject clearly." . . . "For many years there has been a distinct need for a book of this sort; it fills a gap in aeronautical literature."
Only $2.50

12. Lightplane Flying
By Wolfgang Langewiesche, pgs. 221, illus.
A lively, interesting, informative book with abundant material to develop interest for the instructors, flying students, and everyone who might be interested in flying.
Only $2.50

13. Flight Without Power
By Lewin B. Barringer, pgs. 275, illus.
The complete authoritative story of motorless flight. This book gives you a sound background of soaring and gliding, tracing the history of man's first attempts to capture the effortless winging of gulls, down through the years to today's great accomplishments and knowledge of aeronautics.
Only $3.00

14. Aircraft Materials and Processes
By George F. Titterton, pgs. 344, illus.
A thorough and practical treatise on all modern aeronautical materials and the effects of various manufacturing processes on their properties. Recommended for inspectors, designers, purchasing agents and students.
Only $3.50

15. Airplane Design Manual
By Frederick K. Teichmann, 350 pgs., 170 illus.
"The author is to be complimented on a fine piece of work. His text is remarkably complete; his tables exhaustive. It is so well written and so complete that it may well serve for self instruction."
Only $4.50

16. Aircraft Radio and Electrical Equipment
By Howard K. Morgan. 384 pgs., 215 illus.
Here is a book written to provide clear understanding of the operation and use of present-day equipment, and beyond that to enable the reader to keep up with the developments which are already clearly forecast.
Only $4.50

17. Aeronautical Meteorology
By George T. Taylor, Ph. D. 444 pages, illus.
"No factor in safe flight is more important than knowledge of existing weather conditions and knowledge of probable trends."
Only $4.50

21. The Outline of Air Transport Practice
By A. E. Blomquist.
The only modern book on Airline Transportation . . . organization . . . management and operation . . . as applied to passengers, mail and cargo.
Only $4.50

22. Aircraft Mechanics Pocket Manual
By J. A. Ashkouti, Grumman Aircraft Corp. 160 pages. Illustrated. Published 1941.
Data, methods and definitions, essential to the daily need of an Airplane Mechanic. Experienced Mechanics have this book. Beginners need it.
Only $1.50

23. Machine Tools in Aircraft
By R. R. Nolan, Northrup Aircraft, Inc. Cloth. 166 pages. Illustrated. Published 1941.
The man that knows machine tools—how they work—how they are set up for jobs in the industry—is of inestimable value in these times. Here in simplest possible terms is the complete story of Machine Tools for Aircraft Production.
Only $1.50

24. Aircraft Torch Welding
By C. Von Borchers, Kellett Autogiro Corp., and A. Clifron, New York University. Cloth. 164 pages. Illustrated. Published 1941.
The only modern book dealing with torch welding applied to aircraft. Simple, direct language describing the Why, What and How to do it for student, teacher, mechanic and manufacturer.
Only $1.50

28. Aircraft Apprentice
By Leslie MacGregor. 144 pages. Cloth. Illustrated. New. Published in 1942.
Will help you make your choice of occupation in the Aviation Industry . . . in line with your aptitudes and abilities. Reliable authoritative information for men on their way up in the industry or desiring to make Aviation their Career.
Only $1.50

29. Aircraft Assembly
By C. F. Marschner, MacDonald Aircraft Corp. 127 pages. Cloth. Illustrated. New! Published in 1942.
Latest Guide to today's assembly methods in plants throughout the country . . . concisely covers 3 big stages of assembly . . . Primary . . . Secondary and Final. For all men interested in Aviation.
Only $1.00

32. Aircraft Engine and Metal Finishes
By Myron A. Coler. Pages 137. Illustrated.
This book provides a brief description of current American practices employed in finishing the exterior surfaces of aircraft engines and similar parts. It is intended primarily for the reader who is confronted with real problems, but who possesses little or no technical knowledge of finishing procedures.
Only $1.50

33. Aircraft Riveting
By Lear & Dillon. Pages 128. Illustrated.
The book describes types of rivets, rivet materials and latest methods of aircraft riveting. One feature of the guide is a chapter listing "Don'ts for the Riveters."
Only $1.25

34. The American Student Flyer
By Hamburg and Tweney. Pages 704. Illustrated.
The first thorough, complete yet easy-to-understand guide book to all aviation. This book was written for young men and young women who seriously intend to take their places in the cockpits . . . on the production lines . . . at the drawing boards . . . and in the hangars of America's greatest pioneer industry . . . aviation.
Only $1.50

35. Private Pilot's Handbook
By A. G. Norwood. Pages 264. Illustrated.
The first simple text book designed to prepare the student pilot for the examination for the private pilot certificate. Should lead to a better informed and, therefore, safer group of student pilots coming before the flight examiner.
Only $2.50

36. Aircraft Spot and Seam Welding
By Kuntz. Pages 114. Illustrated.
Spot and seam welding has at last been recognized as a major factor in the aircraft industry. It makes for speed plus a cut in production costs. This book will help the aircraft industry solve some of its numerous problems.
Only $1.00

Sound—thoroughly tested for years by practical men all over the globe! Pitman texts teach.

ORDER WITH THIS COUPON

★ . . . by number from this list—either C.O.D. or enclose remittance with order. For complete list check "Into The Wind".

Internationally Famous

PITMAN
PUBLISHING CORPORATION
2 West 45th St., New York, N. Y.

PITMAN PUBLISHING CORPORATION SS
2 West 45th St., New York, N. Y.

Please send me book(s) No(s).....

.....

Name.....

Address.....

City and State.....

I enclose Money Order ☐ Check ☐
Send C.O.D. ☐ Send "Into The Wind" ☐

Washington Letter

DEAR Editor:

Washington is tight-lipped this month. Behind the scenes, things are brewing—perhaps. Meanwhile, there's a lull in news, action, and initiative. One fact broke the calm: there was WPB Chief Donald Nelson's statement incorporated in a report on war production, "that training is proceeding well."

Some "public prodding" was needed to obtain facts for guidance of the Nation's shop teachers. I was, therefore, glad to get *your* letter—your Michigan Letter—asking questions, pointing up, prodding. . . .

You write: *"Transfer of vocational training of war workers from the Office of Education to Manpower Commission has aroused considerable interest. . . ."* But, Executive Order 9247, which was supposed to effect this transfer, didn't quite do it. The Order was clear in transferring to the Manpower Commission the U. S. Employment Service, NYA, Apprenticeship Section, and Training Within Industry. But when it came to vocational training the language became slippery. It read: "Transferred to the Chairman of the War Manpower Commission (are) all functions of the Federal Security Administrator relating to the following matters administered by the United States Office of Education: Loans to students, education and training of war workers, and visual aid for war training."

Observers interpret this to mean that the Office of Education will retain its function of war training. But that Commissioner Studebaker instead of reporting to Paul V. McNutt, Federal Security Administrator, will report to P. V. McNutt, Chairman of the Manpower Commission.

• You write: *"One problem that arises is as follows: some supervisors may be told to do things by one of the agencies of the Manpower Commission, but money for the project has to be approved by the State Board of Vocational Education. This results in cross handling. . . . Is this being clarified?"*

This much can be said: It is quite probable that representatives will be stationed in each of the regional offices of the Manpower Commission who will help iron out questions arising between state vocational officers, the schools, and federal authorities. A directive, now being drafted, may contain policy designed to avoid the very cross handling you mention.

• You write further: *"Most students in vocational and technical schools come from homes in the lower economic levels. Is there any possibility that these students might receive financial aid?"* Yes, that possibility is being talked about in Washington. Chances for anything concrete to come of this talk are wrapped up in these considerations: First, will have to come aid for teachers and school systems themselves. Federal aid for education (S1313) calling for $300,000,000 has not yet been approved by Congress. Then, there is the American Federation of Labor request from Congress to establish a minimum teacher salary of $1500. In addition, there is the prospect that able 18- and 19-year-old boys, high-school graduates, might be sent for technical study in colleges at Army base pay. This will apply, of course, only to the physically qualified, who are subject to military service.

In view of these various proposed forms of federal aid to education, likelihood for paying needy high-school students in order to keep them in school does not look bright.

• *How is pre-induction training faring, you ask.* From Army officials comes the answer: Too early to tell. However, some facts are already available.

In New York City, six weeks after unanimous approval by the Board of Education, more than 2000 pre-induction classes, enrolling 60,000 pupils, were under way. District of Columbia schools have also adopted the program. From smaller cities—Allentown, Pennsylvania, and Flint, Michigan—come reports that students are eager for this new type of war education. Washington officials are also gratified by the fact that the Northcentral Association of Colleges and Secondary Schools has stamped its O.K. on the program.

The big push in pre-induction training, however, is expected in February. Meanwhile, schools are trying to find ways to overcome difficulties which may hold the program back. Principal hurdle is lack of technically trained teachers. Other schools report lack of shop facilities and some are hard pressed to find even classrooms.

But to return to your letter. You say: "The impetus which pre-induction training will give to shopwork will undoubtedly have effects lasting well beyond the war." From the huge Pentagon Building in nearby Washington, world's most confusing office structure and headquarters for Pre-induction Training, comes the refrain: "Amen."

• Your letter did not suggest it, but here's an important item:

In a special bulletin, Selective Service Director Hershey notified all draft boards that "educational services are essential to the war effort."

Director Hershey told local selective service boards that in considering registrants, they must take into account the specific school job in which the men are engaged. Considered "critical" are the following: Superintendents of public and private industrial vocational training; and teachers who are engaged in full-time instruction in one or more of the following subjects designated to prepare students for war activities: trade, vocational, and agricultural subjects and in vocational rehabilitation.

This directive does not mean blanket deferment for shop teachers. It merely means "special consideration" as far as selective service is concerned.

Thanks for reading,

Your Washington Correspondent.

Index to Advertisers

American Technical Society.....17
Bennett Hobby Shop.....22
Brandon Films, Inc.....22
Casein Co. of America.....15
Comet Model Airplane & Supply Co.. 9
Fountain Square Hotel.....19
The Gilson Company.....17
Walter O. Gutlohn, Inc.....22
Hotel Antlers.....19
International Textbook Co.....17
Jefferson Machine Tool Co.....15
Lafayette Radio Corp.....11
The Manual Arts Press.....20
McGraw-Hill Book Co.....16
McKenna Metals Co.....15
McKnight & McKnight.....15
Meissner Manufacturing Co.....17
Ohmite Manufacturing Co.....20
Pittman Publishing Co.....23
South Bend Lathe Works.....cover 2
Stanley Tools..... 9
Sugar Beet Products Co.....cover 4
Western Crafts & Hobby Supplies...22
Jam Handy.....Cover 3
John Wiley & Sons, Inc.....21
World Book Company.....19
X-acto Crescent Products Co.....19

In the classroom the JAM HANDY slidefilms and motion pictures help the teacher SHOW what he means with pictures large enough for every member of the class to see.

If the challenge is to be met—in every school, the HIGH-SCHOOL VICTORY CORPS needs to be well trained . . . *quickly.* New subjects need visual aids to help accelerate learning . . . Tens of thousands of JAM HANDY discussional slidefilms* and motion pictures have been enlisted in this new program . . . to help students SEE and learn . . . There are 17,015 pictures—photographs, charts, drawings and cross-sections—in these slidefilms . . . *Use* of these discussional slidefilms and motion pictures by schools and the armed services is endorsement of their authenticity and effectiveness.

HUNDREDS of Slidefilms and Motion Pictures Ready NOW!

Automotive Mechanical Training Kit-set No. 1—2,829 Pictures
Units of Automobile, Mechanical Principles, Operation, How It Works—(35 slidefilms)

Automotive Mechanical Training Kit-set No. 2—1,910 Pictures
Care and Repair of Passenger Cars and Trucks—(35 slidefilms)

Basic Electricity Kit-set—888 Pictures
Fundamentals of Electricity—(12 slidefilms)

Machining Kit-set—860 Pictures
Fundamentals of Machine-Shop Work—(16 slidefilms)

Oxyacetylene Welding Kit-set—742 Pictures
Fundamentals of Oxyacetylene Welding—(15 slidefilms)

Bench Work Kit-set—970 Pictures
Principles of Bench Work—(10 slidefilms)

First Aid Training Kit-set—1,084 Pictures
A visual training course for first aid—(20 slidefilms)

Selling in America Kit-set—392 Pictures
Distributive Education—(5 slidefilms)

Bridging the Gap Between School and Business—524 Pictures
Distributive Education—(4 slidefilms, 8—15-minute presentations)

Pre-Flight Aeronautics Slidefilm Kit-set—1,742 Pictures
(24 slidefilms)
A slidefilm training course based on the official ground school material of the Civilian Pilot Training Program and checked and approved by the Civilian Pilot Training Service of the Civil Aeronautics Administration. Hundreds of these are in use in schools, C. P. T. P. franchised units and the armed forces.

Aircraft Engine Mechanics Kit-set—1,453 Pictures
Care and Repair of Airplane Engines—(25 slidefilms)

Aircraft Mechanics Kit-set—2,742 Pictures
Care and Repair of an Airplane—(46 slidefilms)

Aviation Metalsmiths Kit-set—879 Pictures
Metalsmithing in Aviation—(15 slidefilms)

Sound Motion Pictures available—46 subjects—on Radio, Electricity, Machines, Automotive Mechanics, General Science, Shop Work, Aircraft Mechanics and others. Information about motion pictures on any of these subjects will be sent on request.

**Film strips with textual material on 35 mm. film which provide for the teacher's own commentary and permits classroom discussion while being shown*

Write for complete information and the name of your authorized JHO visual aids dealer

The JAM HANDY Organization

★New York ★Washington, D. C. ★Detroit ★Dayton ★Chicago ★Los Angeles
Transportation Bldg. 244 Talbott Bldg.